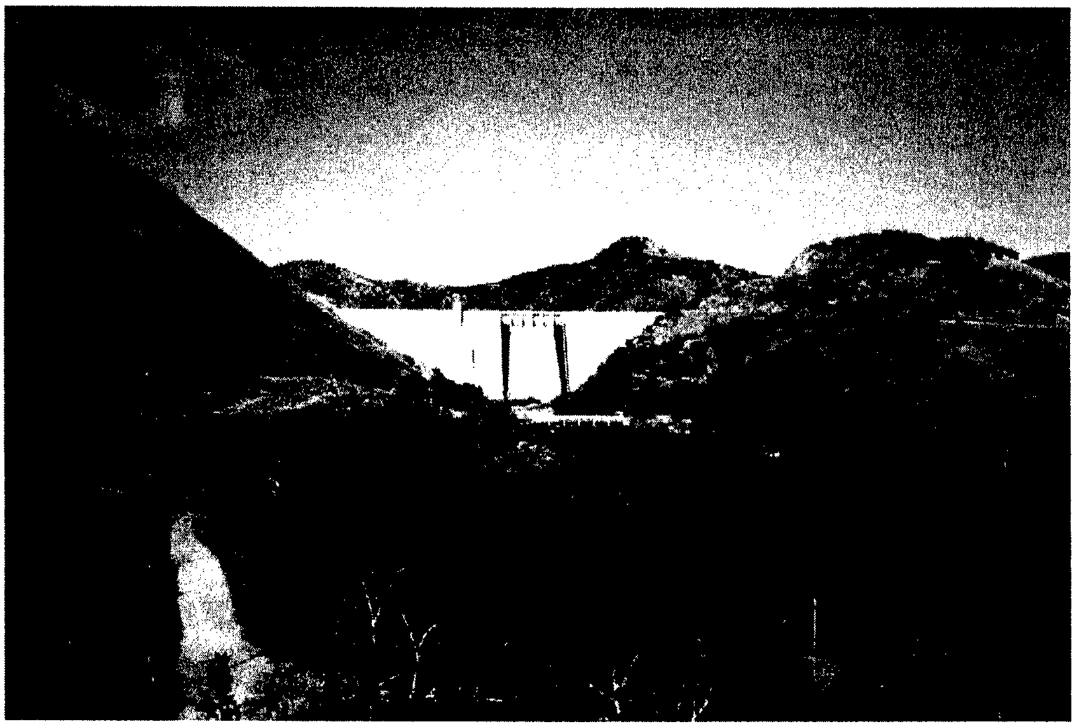
Final Environmental Impact Statement/
Environmental Impact Report (SCH #96042044)

PINE FLAT DAM FISH AND WILDLIFE HABITAT RESTORATION, FRESNO, CALIFORNIA



US Army Corps of Engineers
Sacramento District
South Pacific Division

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FINAL
ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT
PINE FLAT DAM FISH AND WILDLIFE HABITAT RESTORATION INVESTIGATION, CALIFORNIA

DECEMBER 2001

Type of Statement. Final Environmental Impact Statement/Final Environmental Impact Report (EIS/EIR).

Lead Federal Agency: U.S. Army Engineer District, Sacramento.

Lead State Agency: Kings River Conservation District.

Abstract: The U.S. Army Corps of Engineers and the Kings River Conservation District propose to restore and protect the ecosystem for fish and wildlife resources in Pine Flat Lake and in and along the Lower Kings River by improving the fishery habitat; increasing the fishery survival rate; increasing riparian, shaded riverine aquatic, and oak woodland habitats; and reestablishing the historic flood plain and native historic plant and wildlife communities. This final EIS/EIR describes the environment near Pine Flat Dam and Reservoir and along the Lower Kings River in the Pine Flat Dam area; evaluates the direct, indirect, and cumulative environmental effects of the recommended plan and three alternative plans; and recommends mitigation measures. Potential adverse effects would either be short term and insignificant, or would be avoided using best management practices. Beneficial effects on fisheries, vegetation, wildlife, and the historic flood plain from the proposed project alternative are also discussed.

Public Review and Comment: The draft EIS/EIR was available for a 45-day public review and comment period that began on July 13, 2001, with the publication of the Notice of Availability in the Federal Register. All comments received were considered and incorporated into the final EIS/EIR, as appropriate. Comments and responses are included in an appendix to the final EIS/EIR.

SUMMARY

PURPOSE OF STUDY AND EIS/EIR

This study evaluates the feasibility and Federal interest in restoring and protecting the ecosystem for fish and wildlife resources in Pine Flat Lake and in and along the lower Kings River by improving the fishery habitat; increasing the fishery survival rate; increasing riparian, shaded riverine aquatic (SRA), and oak-woodland habitats; and reestablishing native historic plant and wildlife communities.

STUDY AREA

The study area is located in the Kings River Basin in the central and southeast portion of the San Joaquin Valley. The basin is bounded on the north by the San Joaquin River Basin and on the south by the Kaweah River Basin. The Kings River is formed by the North, Middle, and South Forks, which have their headwaters in the Sierra Nevada and converge above the upper end of Pine Flat Lake. The study area is outside of the Fresno city limits in Fresno County east of the city. This study addresses ecosystem restoration in Pine Flat Reservoir, in and along the Kings River downstream of the dam, and at the 143.5-acre Byrd Slough habitat restoration site. For the description of environmental resources and evaluation of effects, the study area is divided into Pine Flat Reservoir, lower Kings River area, and Byrd Slough habitat restoration site (see Plate 1).

NEED FOR ACTION

Due to the design and operation of Pine Flat Dam, a portion of the reservoir can experience a significant increase in water temperature at certain times of the year. When there is adequate water, water temperatures are well within the optimal range for the survival of both coldwater and warmwater fish. In low-water years, however, the availability of coldwater habitat for fisheries can decrease dramatically. In addition, early season irrigation releases deplete the cooler water from the lower level of the reservoir, leaving warmer water from the reservoir's upper layer. Further heating during the summer leaves coldwater fish with even a smaller volume of suitable water temperature habitat.

Water releases from Pine Flat Lake influence fish survival rates downstream, particularly in the lower Kings River. During dry and below average precipitation years, the coldwater reserves are drawn down from the reservoir earlier in the year, causing instream water temperatures to exceed levels acceptable for fish growth and survival. In addition, low flows can adversely affect food supply, transport, and access to SRA habitat. Finally, various land use activities have resulted in the loss of some riparian, SRA, and oak-woodland habitat and associated wildlife along the river.

MEASURES

Initially, a variety of structural and nonstructural measures were evaluated using technical, economic, and environmental criteria. Measures that failed to meet the project's ecosystem restoration objectives, or had excessive costs or adverse environmental effects were eliminated from further consideration. The remaining measures were considered in more detail. These measures included: (1) raising Pine Flat Dam, (2) constructing a multilevel intake structure, (3) constructing a turbine bypass system, (4) constructing a new storage facility on Mill Creek, (5) constructing a water transfer pipeline, (6) restoring spawning gravels, (7) restoring Avocado side channel slough, (8) constructing small check dams at Flume Cove on Pine Flat Lake, (9) restoring habitat at a site along Byrd Slough, and (10) restoring lands on Westlake Farms.

ALTERNATIVE PLANS

Seven of the 10 measures were eliminated from further consideration based on high costs and/or limited benefits, constructed under other authorities, or constructed by local interests. Three final measures were evaluated in more detail and only two measures were formulated into alternative plans. Four alternative plans were formulated from the remaining two measures, including a no action plan. Preliminary economic and benefit analyses indicated that the pipeline component would have high construction costs, limited benefits, and potentially significant adverse environmental effects. As a result, the Corps and non-Federal sponsor agreed not to consider the pipeline further. The four alternatives were then evaluated in more detail.

No Action Alternative

The no-action alternative describes the without-project conditions and is the baseline for the environmental analysis. This alternative assumes that there would be no Federally funded ecosystem restoration in the study area. The releases from the dam would not change, and the adverse effects of low storage, seasonal stratification, and high water temperatures on coldwater fisheries would continue. Riparian and SRA habitat for fish and wildlife would continue to be limited (and further degraded) along the lower Kings River. The no action alternative provides a baseline to evaluate the effects of all other alternatives.

However, the Kings River Conservation District, Kings River Water Association, and California Department of Fish and Game are involved in a cooperative voluntary program to balance fishery needs with other beneficial uses of the Kings River. Under the Kings River Fisheries Management Program, these agencies have implemented, or intend to implement, several actions including the establishment of a 100,000 acre-foot temperature control pool within the reservoir, increasing minimum flows, trout stocking

and habitat improvement, public education and involvement, public access improvements, and regulating fishing along the lower Kings River.

Multilevel Intake Structure Alternative

Objective

This alternative would allow water at various elevations and temperatures in the reservoir to be combined when released through the dam to the downstream channel. Mixing water from various elevations in the reservoir would preserve the cold water in the reservoir and promote downstream water temperatures suitable to sustain the coldwater fishery throughout the year, especially in the later summer and fall when the cold water can become depleted.

Features

- Three separate steel (space frame) structures would be constructed on the upstream face of the dam.

- Each of the three structures would have three port openings and gates.

- There would be a hoist and cable unit for each of the nine openings.

- The three port openings would be staggered at seven different elevations, which would permit selective withdrawal of water from a range of levels in the reservoir.

Accomplishments

- Preserve cold water in the reservoir for fish habitat.

- Promote downstream water temperatures suitable to sustain the coldwater fishery when cold water is limited in late summer and fall.

Byrd Slough Habitat Restoration Alternative

Objective

This alternative was formulated to reestablish riparian, SRA, and oak woodland habitat along the Kings River.

Features

- Acquire 143.5 acres of Fresno County Greenbelt Park from Fresno County.

- Repair perimeter fences, install a re-vegetation sign, exclude cattle, plant restoration species, design and construct an irrigation system, and install wildlife habitat enhancement structures.

Accomplishments

- Restore riparian and SRA habitat along the Kings River.

- Preserve the riparian corridor and historic flood plain along the Kings River.

Combined Restoration Plan Alternative

This alternative would involve combining the multilevel intake structure alternative with the Byrd Slough habitat restoration alternative.

Objective

This alternative was formulated to maximize net benefits and is the most cost-effective plan that meets the objectives of the project. The combination would benefit the ecosystem for fisheries and wildlife in the lower Kings River where flows during later months of the year do not sustain coldwater fisheries due to decreased water supply and higher water temperatures.

Under this alternative, the multilevel intake structure would allow greater flexibility in providing colder temperatures in the Kings River for about 13 miles below the dam, thereby reducing thermal stress on the fishery during warm-water releases in below-normal water years. The multilevel intake structure would provide the needed temperatures to benefit a variety of fish, especially the coldwater fishery, downstream of the dam. Ecosystem restoration would increase riparian, SRA, and oak woodland habitats along the existing riparian corridor, improving wildlife habitat and adding shade for the aquatic environment.

The combination of the multilevel intake structure and habitat restoration alternatives would provide increased and improved habitat for the fish and wildlife in Pine Flat Reservoir and about 13 miles of the Kings River downstream of Pine Flat Dam. The combination would also restore the historic flood plain and increase ecosystem values at the restoration site.

Features

- Combination of the features of the multilevel intake structure alternative and Byrd Slough habitat restoration alternative.

Accomplishments

- Combination of the accomplishments of the multi-level intake structure and Byrd Slough habitat restoration alternative.

AFFECTED ENVIRONMENT

Environmental resources not affected by the alternatives include topography, geology, and soils; noise; esthetics and visual setting; socio-economics; recreation; hazardous, toxic, and radiological waste; and traffic. Significant resources that may be affected by the alternatives include vegetation and wildlife, fisheries, special status species, water quality, air quality, land use/prime and unique farmland, and cultural resources.

ENVIRONMENTAL EFFECTS AND MITIGATION

Table 1 summarizes the adverse environmental effects of the four alternatives on the environmental resources identified in the previous paragraph. No resources would experience significant short- or long-term effects and require mitigation measures beyond best management practices. Table 2 summarizes the mitigation measures to avoid and minimize the adverse effects of the multilevel intake structure, Byrd Slough habitat restoration, and combination alternatives.

ENVIRONMENTAL COMMITMENTS

Environmental commitments are the mitigation measures (including best management practices) or design/operational actions incorporated into the project to avoid, minimize, or compensate for significant environmental effects. Table 2 shows the environmental commitments for the three action alternatives. These commitments would be included in the plans and specifications phase of the project.

COMPLIANCE WITH APPLICABLE LAWS, POLICIES, AND PLANS

The project will comply with all Federal laws, regulations, and Executive orders when the endangered species coordination is completed. In addition, the non-Federal sponsor will comply with all State and local laws and permit requirements.

MAJOR CONCLUSIONS AND FINDINGS

The alternatives would have beneficial effects on fish and wildlife environmental resources in the study area. The alternatives would have no significant adverse effects on environmental resources in the area. Minor effects would either be short term or would be avoided using best management practices.

PUBLIC INVOLVEMENT

Public concerns focused on restoring fish and wildlife habitat at Pine Flat Reservoir and along the lower Kings River. These issues were discussed with the non-

Federal sponsors, other agencies, and local interests. The Corps considered these discussions when identifying resources and evaluating the environmental effects of the alternatives.

The draft EIS/EIR was released for public and agency review on July 13, 2001. Comments from the public review were considered in the preparation of the final environmental document. Copies of the comments and Corps responses are included in Appendix F to the final EIS/EIR.

UNRESOLVED ISSUES

There are two unresolved issues at this time. The Fish and Wildlife Service Coordination Act Report (CAR) will be finalized in December 2001; the recommendations contained in the draft CAR (January 2000) are not expected to change. The CAR has not been finalized due to the lack of closure of endangered species coordination. The endangered species coordination will be completed in November 2001 and is expected to comply with the findings proposed in the draft EIS/EIR.

SELECTED PLAN

The proposed action ("Recommended Plan" in the main report) is the combined restoration plan as described in Section 2.2.4. The Selected Plan will be identified after the public review of the draft EIS/EIR.

Table 1. Summary of Environmental Effects

Affected Environment	No Action	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Topography, Geology, and Soils	No change from current trends.	No change.	Temporary disturbance.	Temporary disturbance.
Noise	Noise levels would be the same as existing conditions.	Temporary increase in noise levels during construction.	Temporary increase in noise levels during construction	Temporary increase in noise levels during construction
Esthetics and Visual Setting	No change from current trends.	Temporary effects and some permanent changes to the viewshed.	Temporary effects and some permanent changes to the viewshed.	Temporary effects and some permanent changes to the viewshed.
Socioeconomics	Population would continue to increase.	No change from current trend is expected.	No change from current trend is expected.	No change from current trend is expected.
Recreation	Fishery resources would not change under existing conditions..	Fishery resources would increase, enhancing the recreational experience. Some temporary disturbance would reduce the quality of recreation during construction.	Fishery resources would increase, enhancing the recreational experience.	Fishery resources would increase, enhancing the recreational experience. Some temporary disturbance would reduce the quality of recreation during construction.
Hazardous, Toxic, and Radiological Waste (HTRW)	No HTRW sites are known at this time.	No HTRW sites are known at this time.	No HTRW sites are known at this time.	No HTRW sites are known at this time.
Traffic	Traffic volumes on Pine Flat Dam	Effects would be temporary and of	Effects would be temporary and of	Effects would be temporary and of

Affected Environment	No Action	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
	Road, Trimmer Springs Road, and Piedra Road may increase in the future.	short duration. Traffic volumes on Pine Flat Dam Road and Trimmer Springs Road may increase by an insignificant amount.	short duration. Traffic volumes on Piedra Road may increase by an insignificant amount.	short duration. Traffic volumes on Pine Flat Dam Road, Trimmer Springs Road, and Piedra Road may increase by an insignificant amount.
Vegetation and Wildlife	There would be no significant changes from existing conditions at the reservoir or along the lower Kings River.	Temporary, minor, construction-related disturbances would occur.	Temporary, minor, construction-related disturbances would occur in the short-term, but in the long-term overall wildlife habitat values would be increased.	Temporary, minor, construction-related disturbances would occur in the short-term, but in the long-term overall wildlife habitat values would be increased.
Fisheries	Fishery resources would not change from existing conditions.	Temporary, minor disturbances would occur during construction of the multilevel intake structure in the short-term, but in the long-term, overall fish habitat values would be increased.	Fishery resources could be indirectly improved. Riparian and SRA habitat would regenerate along the lower Kings River.	Consists of a combination of the direct effects of the multilevel intake structure and indirect effects of the Byrd Slough habitat restoration to fish resources.
Special Status Species	Habitat conditions would not change from existing conditions.	The bald eagle and Swainson's hawk may be temporarily disturbed. Foraging habitat for the bald eagle may improve due to increased fishery.	The valley elderberry longhorn beetle, California red-legged frog, little willow flycatcher, Swainson's hawk, San Joaquin wooly threads, palmate-bracted bird's –beak, Hoover's Eriastrum, California jewel lower, tree-anemone, and San Joaquin Adobe Sunburst would be avoided. Habitat for listed species would be increased.	The bald eagle and Swainson's hawk may be temporarily disturbed. Foraging habitat for the bald eagle may improve due to increased fishery. Any listed species that may be adversely affected would be avoided at the Byrd Slough restoration area. Habitat for listed species would be increased.
Water Quality	Surface and ground- water quality would not change.	The proposed project would not have any adverse effects on water quality since best management practices would be implemented.	The proposed project would not have any adverse effects on water quality since best management practices would be implemented. Water quality may be indirectly improved by restoration in the long-term.	The proposed project would not have any adverse effects on water quality since best management practices would be implemented. Water quality may be indirectly improved by restoration in the long-term.
Air Quality	Local emission rates would not change and may improve over time with stricter standards.	Adverse air quality effects would be minor, temporary, and short-term.	Adverse air quality effects would be minor, temporary, and short-term.	Adverse air quality effects would be minor, temporary, and short-term.

Affected Environment	No Action	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Land Use/Prime and Unique Farmland	Flood control, water conservation, hydroelectric power generation, and recreational development would occur as described in current city and county plans.	No change from current trends.	143.5 acres acquired in fee by non-Federal sponsor; oak woodland vegetation plantings; riparian vegetation naturally regenerated; grazing would be discontinued.	143.5 acres acquired in fee by non-Federal sponsor; oak woodland vegetation plantings; riparian vegetation naturally regenerated; grazing would be discontinued.
Cultural Resources	No change.	No adverse effects to cultural resources would occur.	No adverse effects to cultural resources would occur.	No adverse effects to cultural resources would occur.

Table 2. Summary of Environmental Mitigation and Commitments

Affected Environment	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Topography, Geology, and Soils	There would be no significant adverse effects to topography, geology, and soils due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to topography, geology, and soils due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to topography, geology, and soils due to this alternative; therefore, no mitigation would be needed.
Noise	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.
Esthetics and Visual Setting	There would be no significant adverse effects to esthetics and visual setting due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to esthetics and visual setting due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to esthetics and visual setting due to this alternative; therefore, no mitigation would be needed.
Socioeconomics	There would be no significant adverse effects on socioeconomic trends due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on socioeconomic trends due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on socioeconomic trends due to this alternative; therefore, no mitigation would be needed.
Recreation	There would be no significant adverse effects on recreation due to this alternative; therefore, no mitigation would be needed. The recreational experience may be improved by this alternative.	There would be no significant adverse effects on recreation due to this alternative; therefore, no mitigation would be needed. The recreational experience may be improved by this alternative.	There would be no significant adverse effects on recreation due to this alternative; therefore, no mitigation would be needed. The recreational experience may be improved by this alternative.
Hazardous, Toxic, and Radiological Waste (HTRW)	Any discovered HTRW affected by this alternative would be remediated according to applicable Federal, State, and local regulations.	Any discovered HTRW affected by this alternative would be remediated according to applicable Federal, State, and local regulations.	Any discovered HTRW affected by this alternative would be remediated according to applicable Federal, State, and local regulations.
Traffic	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.

Affected Environment	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Vegetation and Wildlife	There would be no significant adverse effects on vegetation and wildlife due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to vegetation and wildlife due to this alternative; therefore, no mitigation would be needed. Vegetation and wildlife resources would be increased/improved as a result of this alternative.	There would be no significant adverse effects to vegetation and wildlife due to this alternative; therefore, no mitigation would be needed. Vegetation and wildlife resources would be increased/improved as a result of this alternative.
Fisheries	Conditions for fisheries would be improved from without-project conditions; therefore, no mitigation for fisheries would be needed.	There would be no significant adverse effects to fisheries due to this alternative; therefore, no mitigation would be needed.	Conditions for fisheries would be improved from without-project conditions; therefore, no mitigation for fisheries would be needed.
Special Status Species	Foraging conditions for the bald eagle would be improved. No mitigation for listed species is needed.	Habitat for listed wildlife species would be increased and improved. The California red-legged frog and listed plant species would be avoided. Pre-construction surveys would be conducted to avoid listed sensitive species or critical habitats. No mitigation for listed species is needed.	Habitat for listed wildlife species would be increased and improved. Foraging conditions for the bald eagle would be improved. The California red-legged frog and listed plant species would be avoided. Pre-construction surveys would be conducted to avoid listed sensitive species or critical habitats. No mitigation for listed species is needed.
Water Quality	There would be no adverse effects due to this alternative since best management practices would be implemented; therefore, no mitigation would be needed.	There would be no adverse effects due to this alternative since best management practices would be implemented; therefore, no mitigation would be needed.	There would be no adverse effects due to this alternative since best management practices would be implemented; therefore, no mitigation would be needed.
Air Quality	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.
Land Use/Prime and Unique Farmland	There would be no significant adverse effects on land use due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on land use due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on land use due to this alternative; therefore, no mitigation would be needed.
Cultural Resources	There would be no adverse effects to cultural resources; therefore, no mitigation would be needed.	There would be no adverse effects to cultural resources; therefore, no mitigation would be needed.	There would be no adverse effects to cultural resources; therefore, no mitigation would be needed.

CONTENTS

TABLES

PLATES

APPENDIXES

ACRONYMS AND ABBREVIATIONS

AAHU	average annual habitat unit
BA	Biological Assessment
BDR	Biological Data Report
CAR	Fish and Wildlife Coordination Act Report
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
Corps	Corps of Engineers
CVP	Central Valley Project
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DFG	California Department of Fish and Game
EIR	environmental impact report
EIS	environmental impact statement
EPA	Environmental Protection Agency
^{0}F	degrees Fahrenheit
FESA	Federal Endangered Species Act
FID	Fresno Irrigation District
FWS	U.S. Fish and Wildlife Service
HEP	habitat evaluation procedures
HTRW	hazardous, toxic, and radiological waste
HU	habitat unit
KRCD	Kings River Conservation District
KRWA	Kings River Water Association
lbs/day	pounds per day
L_{dn}	day-night average decibel levels
mg/l	milligrams per liter
mg/m^3	micrograms per cubic meter
mph	miles per hour
m.s.l.	mean sea level
NEPA	National Environmental Policy Act
NOx	nitrogen oxides
NRCS	Natural Resources Conservation Service
O&M	operation and maintenance
PG&E	Pacific Gas & Electric Company
PM_{10}	particulate matter 10 microns in size
ppm	parts per million
ROG	reactive organic gases
SHPO	State Historic Preservation Officer
SJAPCD	San Joaquin Valley Unified Air Pollution Control District

SJVAB	San Joaquin Valley Air Basin
SR	State Route
SRA	shaded riverine aquatic
State	State of California
SWP	State Water Project
tons/year	tons per year
ug/m^3	micrograms per cubic meter
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
WUA	weighted useable area

CHAPTER 1.0

PURPOSE AND NEED FOR THE ACTION

1.1 STUDY AUTHORITY

The general authority for this investigation is contained in the 1964 Congressional resolution of the House Committee on Public Works, as follows:

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the report on Sacramento-San Joaquin Basin Streams, California, published as House Document No. 367, 81st Congress, 1st Session, and other reports, with a view to determining whether any modification of the recommendations contained therein are advisable at this time, with particular reference to further coordinated development of the water resources in the San Joaquin River Basin, California."

The study is being conducted in close coordination with local water rights holders and is taking into account existing agreements governing the operation of the Kings River. The study is precluded from proposing actions which would (1) interfere with existing Kings River water rights, storage rights, or operations or (2) require any involuntary acquisition of water rights, storage rights, or land.

1.2 STUDY AREA LOCATION AND SETTING

1.2.1 Kings River Basin

The Kings River basin is located primarily in Fresno County in the San Joaquin Valley. The basin encompasses about 3,445 square miles and includes part of the valley and the western slopes of the Sierra Nevada. The upper basin, which consists of 1,545 square miles above Pine Flat Dam, is among the most rugged areas in the Sierra Nevada and is characterized by sharp peaks and ridges, precipitous canyons, and granite domes. Soil cover ranges from moderate in the lower elevations to nonexistent above 10,000 feet. The upper basin is suitable for grazing, lumbering, hydroelectric power generation, mining, and recreation. The area is sparsely populated.

The lower Kings River basin includes an alluvial plain of about 1,900 square miles, which ranges in elevation from about 400 feet at the foothill line to 200 feet at the edge of Tulare Lake basin and 180 feet along the Kings River North (Fresno Slough). Excellent soils, moderate climate, and availability of summer streamflow and ground water for irrigation make the lower basin a world-renowned agricultural area. The major population center is the city of Fresno.

The Kings River originates high in the Sierra Nevada and flows in a southwest direction as it leaves the foothills and enters the San Joaquin Valley. Below Pine Flat Dam, flows from the Kings River divide into numerous channels, which converge into a single channel before dividing into Kings River North and Kings River South (see Plate 1). The Kings River North only flows into the San Joaquin River during flood operations, and Kings River South flows into the Tulare Lake basin.

1.2.2 Pine Flat Dam and Reservoir

Pine Flat Dam was completed by the U.S. Army Corps of Engineers in 1954 for flood control and water conservation. The dam is a concrete-gravity structure, which is 429 feet high and 1,820 feet long at the crest. The reservoir has a storage capacity of about 1 million acre-feet at gross pool, all of which is available for flood control when required. In addition to the dam, the project included penstocks for hydropower, downstream improvements to control flooding, and diversion of flows between the Kings River North and Kings River South. Downstream channel clearing and construction of levees and weirs were completed in 1976.

The project provides flood protection to about 80,000 acres of agricultural land along the Kings River and 260,000 acres of agricultural land in the Tulare Lakebed (in conjunction with other projects on the Kaweah, Tule, and Kern Rivers). Recreation is an incidental benefit of the project. A non-Federally owned hydroelectric power plant was completed below the dam by the Kings River Conservation District (KRCD) in 1984.

1.2.3 Lower Kings River

The 143.5-acre Kings River Green Belt Park is owned by Fresno County and used for recreational activities such as fishing, hiking, and wildlife viewing. Currently, there is a high water table with well-established riparian vegetation along Byrd Slough and a thin band of riparian habitat along the Alta Main Canal. Also, there are water conveyance ditches and control structures that were previously used for irrigation. Incidental grazing by livestock occurs in the area due to unstable fencing.

1.3 NEED AND OBJECTIVES OF THE ACTION

The Corps and the KRCD, the non-Federal sponsor, and Kings River Water Association (KRWA), an equal cost-sharing partner with KRCD, are proposing to restore historic ecosystem values in the study area. Native fish, vegetation, and wildlife resources along the lower Kings River (from Pine Flat Dam to Highway 180) have declined due to development, low streamflows, and elevated water temperatures. Construction and operation of Pine Flat Dam

contributed to this decline by changing the character of the Kings River (Corps, 1994a).

Construction and operation of Pine Flat Dam modified the river environment for native fisheries. Historically, 11 fish species have occurred in the Kings River basin: rainbow trout, Chinook salmon, Kern brook lamprey, threespine stickleback, Sacramento sucker, riffle sculpin, prickly sculpin, hardhead, hitch, Sacramento squawfish, and California roach. After construction of the dam, the native rainbow trout fishery was replaced with a stocked reservoir and downstream rainbow trout fishery (Corps, 1996b).

Early land reclamation work on the lower Kings River eliminated numerous oxbows, reducing bird and waterfowl habitat. In addition, flooding of Tulare Lakebed, which in very wet years had a substantial wintering population of waterfowl, was reduced. Today, the Tulare Lakebed does not usually flood except during wet years when floodflows enter the basin (Corps, 1996a).

Based on this decline in native fish, vegetation, and wildlife, there is a need to restore these valuable environmental resources in the area. The specific objectives of the proposed action are to (1) improve coldwater fishery survival in Pine Flat Lake and in the Kings River downstream of the dam, (2) improve sustainability of the coldwater fishery in Pine Flat Lake and in the Kings River downstream of the dam for wet, normal, dry, and critical dry years, (3) improve optimum water temperatures for the coldwater fishery in Pine Flat Lake and in the Kings River downstream of the dam, (4) improve riparian, SRA, and flood plain habitat along the lower Kings River, and (5) restore ecosystem by reestablishing native historic plant and wildlife communities along the lower Kings River.

1.4 SIGNIFICANT ENVIRONMENTAL ISSUES

The significant environmental issues involve coldwater fishery habitat and riparian and shaded riverine aquatic (SRA) habitat. These issues are evaluated in this Environmental Impact Statement/Environmental Impact Report (EIS/EIR).

Coldwater Fishery Habitat

Due to the design and operation of Pine Flat Dam, the reservoir can experience a significant increase in water temperature at certain times of the year. When there is adequate water, water temperatures are well within the optimal range for the survival of both coldwater and warmwater fish. In low-water years, however, the availability of coldwater habitat for native fisheries in the reservoir and lower Kings River can decrease dramatically.

Water releases from Pine Flat Lake influence the fishery downstream in the lower Kings River. During dry and below average precipitation years with

below average carryover storage, the coldwater reserves may be depleted from the reservoir by late summer and early fall, causing water temperatures in the reservoir and lower Kings River to exceed levels acceptable for coldwater fish growth and survival. In addition, low instream flows can adversely affect food supply, spatial habitat, and access to SRA habitat, and provide favorable habitat for nonnative warmwater fishery growth, which further declines the native coldwater fishery survival rate.

Riparian and Shaded Riverine Aquatic Habitat

Construction and operation of Pine Flat Dam and various land use activities have resulted in loss of riparian and SRA habitat and associated wildlife along the lower Kings River. Public interest is high in restoring the ecosystem through revegetation and preservation of lands along the river. There are potential restoration areas along the river that are currently in public ownership and that are contiguous to other areas with higher habitat value.

Restoration of riparian and SRA habitat would benefit fish and wildlife. Riparian habitat could provide foraging, resting, and breeding area for mammal, reptile, amphibian, and bird species that inhabit the area. Additional riparian vegetation would help to improve water quality due to its capacity to filter water. SRA habitat would provide protective cover for fish, nutrients for instream aquatic organisms, and shade for cooling.

1.5 DECISION TO BE MADE BASED ON THE EIS/EIR

The District Engineer, the commander of the Sacramento District of the Corps of Engineers, must decide whether or not to recommend that a plan described in this report be authorized for implementation as a Federal project, with modifications at the discretion of the Chief of Engineers.

1.6 ORGANIZATION OF THE EIS/EIR

The EIS/EIR is divided into 8 chapters. Chapter 2 discusses the plan formulation and alternatives considered for this project. Chapter 3 discusses the environment of the study area, and chapter 4 discusses the effects of the alternatives on the affected environment and describes mitigation measures. Chapter 5 presents other legal and policy requirements in an EIS/EIR. Chapter 6 is a list of preparers; Chapter 7 lists references; and Chapter 8 is the index.

CHAPTER 2.0

ALTERNATIVES INCLUDING THE PROPOSED ACTION

Plan formulation is the process of developing and evaluating alternative plans to meet the needs and desires of society's expressed in specific planning objectives. This planning process is in accordance with the Federal Water Resources Council's Principles and Guidelines. Planning objectives and formulation criteria are used to develop and evaluate project alternatives. The plan formulation process is explained in detail in Chapters IV, V, and VI of the Feasibility Report.

The purpose of this chapter is to describe the alternatives (potential actions) and summarize their environmental effects. This chapter discusses the differences between the alternatives and summarizes their environmental effects and mitigation.

2.1 ALTERNATIVE MEASURES CONSIDERED BUT ELIMINATED FROM DETAILED DISCUSSION

2.1.1 Raise Pine Flat Dam

This measure would consist of raising Pine Flat Dam and spillway by 7 feet in order to benefit fish and wildlife. Raising the dam would increase the reservoir pool about 15 feet. The increased reservoir pool would provide 93,000 acre-feet for a minimum pool. Water to fill the 93,000 acre-foot pool would be provided by the water rights holders from water that would otherwise be released during Corps-directed flood control releases.

Raising the gross pool would benefit the warmwater fishery by increasing the reservoir surface area for greater spatial distribution, particularly in the spring and summer months. The increased storage area in the lake would improve the ability to maintain cooler temperatures for the coldwater fishery. Maintaining a minimum pool would also provide downstream benefits in terms of spatial habitat, and cooler water temperatures. Incidental hydropower generation would also increase as a result of holding a minimum pool.

While raising Pine Flat Dam would have environmental benefits, there would also be several adverse effects. First, riparian and SRA habitat upstream of the reservoir would be flooded about three-fourths mile up the Kings River for about 1 month in 20 percent of the years. Five recreation sites at Pine Flat Lake would be periodically inundated. About 295 acres of oak woodland, oak savannah, and nonnative valley grassland would be periodically inundated. Finally, the hydroelectric power plant that Pacific Gas & Electric (PG&E) operates

at the upstream limit of the reservoir would need to be modified to accommodate the increased reservoir elevation.

In addition, Pine Flat Dam is located in seismic zone 3, in which the hazard (damage capability) is considered to be major. The dam is currently scheduled to be evaluated for seismic integrity under a nationwide dam safety program. Because of the uncertainty regarding the safety of the dam at an increased lake level, study and construction costs, and significant project effects, the Corps and non-Federal sponsor agreed prior to initiation of the feasibility phase that this measure would not be considered for further evaluation at this time.

2.1.2 Construct a Turbine Bypass System

This measure would consist of constructing a conduit system to the existing penstocks to allow for low flows to bypass the power plant turbines. This measure would allow greater flexibility in making releases at various water elevations by allowing releases through the penstocks when flows are less than the 500 to 600 cubic feet per second (cfs) necessary to run the power plant. In this way, limited releases of colder water could be made into the river to benefit the coldwater fishery during dry periods of the year.

This measure was recommended for investigation separately under Section 1135 of the Water Resources Development Act of 1986, as amended. The project modification report for the turbine bypass project was completed in September 1996, and the project was authorized for construction in Section 105(b) of the Water Resources Development Act of 1999. This project is considered to be the first increment in an overall plan to manage the coldwater fishery resource in the lake. Currently, the project is in the plans and specifications phase of design, and construction is scheduled to be completed in 2002/2003. The turbine bypass system is assumed to be part of the without-project conditions (Corps, 1996b).

2.1.3 Construct a New Storage Facility on Mill Creek

This measure would consist of constructing a 650,000 acre-foot storage facility at Mill Creek. This would allow a permanent minimum pool of 300,000 acre-feet in Pine Flat Lake, which would benefit fish, wildlife, and recreationists. The minimum pool would reduce reservoir fluctuations, improving spawning success for fish in Pine Flat Lake. Releases from Pine Flat Dam would also improve downstream spatial habitat for trout, improve water temperatures, and increase spawning areas. The pool would also encourage use of recreational facilities and opportunities at the lake.

Reservoir construction would degrade or destroy about 3,700 acres of upland habitat and inundate 15 miles of Mill Creek and 1.7 miles of tributaries.

Loss of these resources would require significant mitigation for wildlife. The warmwater fishery in Mill Creek would also be lost, as would spawning gravel habitat. About 175 residences and one commercial operation would need to be relocated. In addition, there are six cultural resource sites and five ethnographic sites located within the proposed work area.

The estimated first cost for construction of Mill Creek Dam is $468 million. This measure was not carried forward for further evaluation because of the significant environmental effects, high costs, and lack of local support.

2.1.4 Construct Water Transfer Pipeline

This measure would consist of facilitating a means of exchanging water from an out-of-basin source such as the Central Valley Project (CVP) and/or State Water Project (SWP) for water stored in Pine Flat Lake. The exchange would provide water to augment instream flows in part of Kings River below Pine Flat Dam in late summer and fall. However, there would be no net water change resulting from the exchange.

During the irrigation season, exchanged water from either the CVP and/or SWP would be delivered to a member unit of the KRWA with available CVP and/or SWP contracts. The member unit's water remaining in Pine Flat Lake which is scheduled to be released, but is not because of the exchange, would be stored for later release to augment flows in the lower Kings River during the critical coldwater fishery stress period from September through November.

The exchanged water would flow through the lower Kings River to the Fresno Weir and then would be conveyed through the Fresno Irrigation System (FID) existing system of canals to the FID western boundary. From this point, a new underground pipeline would be constructed to carry the exchanged water to the Mendota Pool area for return to another CVP and/or SWP contractor. Using the FID existing system would minimize the construction of new facilities to complete the connection to the Mendota Pool area.

Due to the potential benefits, this measure was considered further as an alternative and used in the formulation of four potential alternative plans. However, preliminary economic and benefit analyses indicated that the estimated first cost for construction of the water transfer pipeline was at least $30 million with relatively limited aquatic and terrestrial benefits. In addition, there was the potential for significant adverse effects on vernal pool/alkali scald habitat and special-status species along the pipeline. Any additional costs for mitigation would have further increased the high cost. Due to these high construction costs, limited benefits, and potential adverse environmental effects, the Corps and non-Federal sponsor agreed that these four pipeline alternatives should not be considered further.

2.1.5 Restore Spawning Gravels

This measure would consist of creating several thousand square feet of new spawning gravels in the lower Kings River. Boulders would be installed in areas that have sufficient flow with adequate temperature and would create hiding and nesting cover for trout and other fish species in the river.

In the spring of 2000, construction of the first artificial trout spawning and rearing channel was completed on the Kings River as part of the Kings River Fisheries Management Program. It is located 5 miles downstream of Pine Flat Dam and is about 2,000 feet long. The channel was named as the Thorburn Spawning Gravel Project in honor of the landowners who granted an easement for the project. Other spawning gravel and rearing channels are planned in the future as components of the Kings River Fisheries Management Program. The State and local participants are fully committed to implementing the other actions in this program. As a result, this measure was not carried forward for further evaluation.

2.1.6 Restore Avocado Side Channel Slough

This measure would consist of restoring the Avocado Side Channel Slough, which is a small, natural side channel adjacent to the Kings River just downstream of Avocado Lake. River water enters the channel during high irrigation and flood releases. Restoration would involve channel excavation for suitable depths and flows, headgate installation for flow control, gravel placement for spawning areas, addition of woody debris and rocks for fish cover, and planting of riparian vegetation for shade, cover, and wildlife. The channel would also provide refuge for fish from the high river flows and rearing areas for juvenile fish.

This measure was recommended for investigation separately under Section 1135 or Section 206 of the Water Resources Development Act of 1986. As a result, this measure was not carried forward for further evaluation.

2.1.7 Construct Small Check Dams at Flume Cove

This measure would consist of constructing several small check dams within the Pine Flat Reservoir pool to create spawning areas for fish when the lake levels are high. As the lake level recedes, the water left behind in the check dams would promote the growth of buttonwillows, which would benefit wildlife by providing vegetated corridors to access the water. This measure would most effectively be implemented in conjunction with raising Pine Flat Dam.

However, raising Pine Flat Dam is not being considered further due to the uncertainty regarding the safety of the dam at an increased lake level. Without

an increased gross pool, the potential restoration benefits of check dams would likely not be significant. Therefore, this measure was not carried forward for further evaluation.

2.1.8 Restore Lands on Westlake Farms

This measure would consist of restoring 1,280 acres of land owned by Westlake Farms in the Tulare Lake basin. Historically, this land was subject to periodic flooding, but no longer displays any wetland characteristics and consists of leveled agricultural land. Restoration would consist of restoring wetland and upland vegetation by moving surface waters onto the site and would require the construction of water conveyance and management features.

This measure would partially meet the planning objectives. However, because of potential high costs for conveyance facilities and management, lack of surplus surface water, and distance from the other measures (about 70 miles), this measure was not carried forward for further evaluation.

2.2 ALTERNATIVES CONSIDERED IN DETAIL

This section describes the four alternative plans evaluated in detail. These plans include No Action, Multilevel Intake Structure, Byrd Slough Habitat Restoration, and the Combined Restoration Plan.

2.2.1 No Action

Under this alternative, the Corps would not participate in ecosystem restoration in the study area. The releases from the dam would not change, and the adverse effects of low storage, seasonal stratification, and high water temperatures on fisheries would continue, resulting in the continued decline of the coldwater fishery both in the lake and below the dam. Habitat for wildlife would continue to be limited along the lower Kings River.

Kings River Fisheries Management Program

State and local efforts would continue to improve environmental conditions in the study area. Beginning in 1994, a voluntary effort was undertaken to establish a fisheries management program for the Kings River. The need for such a voluntary program was to balance the fishery needs with other beneficial uses of the Kings River while maintaining established water and storage rights. Participants in the program included the California Department of Fish and Game (DFG), KRCD, and KRWA. On May 28, 1999, the Kings River Fisheries Management Program Framework Agreement was signed, which established a number of aquatic resource enhancement goals for the lower Kings River and Pine Flat Lake.

These goals include enhancing fishery habitat in Pine Flat Lake and the river downstream while balancing the beneficial uses of the Kings River. The adaptive management program includes several actions: establishing a 100,000 acre-foot temperature control pool within the reservoir, increasing minimum flows, providing annual funding, trout stocking and fishery habitat improvement, public education and involvement, public access improvements, program monitoring, and regulating fishing along the lower Kings River.

Under the fisheries management program, enhanced minimum flows were established in the Kings River in its 10-mile reach between Pine Flat Dam and the Fresno Weir. These flows were in addition to those provided by a 1964 agreement between KRWA and DFG. Voluntary flows of at least 95 cfs to Fresno Weir and 5 cfs to the Dennis Cut Weir were provided by member water rights units of the KRWA. In addition to these enhanced minimum water flows in the river and creation of the temperature control pool in the reservoir, the fisheries management program constructed the Kings River's first artificial trout spawning and rearing channel in the spring of 2000. The channel, which is located 5 miles downstream of Pine Flat Dam, is about 2,000 feet long. The channel was named the Thorburn Spawning Gravel Project in honor of the landowners who granted an easement for the project.

The DFG, KRCD, and KRWA are continuing to study, and intend to implement, additional components of the fisheries management program, including additional spawning gravel and rearing channels and fish habitat restoration projects, as well as fish stocking, enforcement, public information and education, stream monitoring, and program funding. An important component of this management program is to maintain support for the Corps' efforts and studies involving potential projects for ecosystem restoration on the Kings River.

Without-Project Assumptions

Based on the Kings River Fisheries Management Program and the recent authorization of the Corps' turbine bypass project, the following specific without-project conditions are assumed: (1) temperature control pool of 100,000 acre-feet in Pine Flat Lake, (2) enhanced flows of at least 95 cfs to Fresno Weir, (3) spawning gravels in parts of the lower Kings River, (4) annual stocking of the lower Kings River with rainbow trout, and (5) turbine bypass system in place. The no action alternative provides a baseline to evaluate the effects of all other alternatives.

2.2.2 Multilevel Intake Structure

Selection of Design

The design of the multilevel intake is similar to the space frame structure, which the U.S. Bureau of Reclamation constructed at Shasta Dam in northern

California. The design can be applied to Pine Flat Dam with only a few modifications in the size of gates and bays enclosing each penstock intake.

Seven different port configuration designs were evaluated to identify the port configuration which would be the most cost effective; that is, provide the maximum fishery benefits at the least cost. Both straight and staggered configurations of 9, 12, and 21 ports were considered. The results of the computer modeling and cost analysis indicated that a 9-port configuration staggered at seven different elevations would be the most cost-effective design. Technical details of the evaluation are included in Chapter IV of the main report.

Features

This alternative would consist of constructing a multilevel intake on the upstream face of the dam (see Plates 2, 3, and 4). The multilevel intake would consist of three separate steel (space frame) structures which extend from elevation 953.46 feet, mean sea level (m.s.l.), downward to elevation 616.5 feet, m.s.l. The three separate steel structures would fit over the three existing power penstock intakes. Each of the three structures would have three port openings and gates. There would be a hoist and cable unit (including a motor) for each of the nine openings. The three port openings would be 25 feet high and 42 feet wide and would be staggered at seven different elevations that would permit selective withdrawal of water from a wide range of levels in the reservoir.

The 27-foot-high by 44-foot-wide steel gates would be constructed to close off each of the new port openings. One gate on all three of the structures would be at the same elevation, and two gates on each of the structures would be at different elevations. The gates would open in the downward direction and would sit in a structural channel when completely open. This design would take the gate loadings off the hoist cable. Cladding would be placed on the space frame to enclose each of the structures. Steel plates would be put on the bottom of each of the space frame structures to prevent water from leaking into each structure. A trashrack would be placed on the front face of each of the structures to prevent any large debris from entering the port openings and to protect the structure. Construction equipment and material would be stored at the 2.07-acre staging area located on Federal property near the left abutment of the dam.

Accomplishments

The multilevel intake structure would allow water at various elevations and temperatures in the reservoir to be combined when released through the dam to the downstream channel. Mixing water from various elevations in the reservoir would preserve the cold water in the reservoir and promote downstream water temperatures suitable to sustain the coldwater fishery throughout the year, especially in the late summer and fall when the cold water can become depleted. With the multilevel intake structure and adjusted minimum reservoir temperature

control pool of 100,000 acre-feet, the structure would be capable of limiting release temperatures to a maximum of 64.4 degrees Fahrenheit (°F). While this feature would allow greater control of the temperature of the water release, it would not increase the available supply of water.

Operation and Maintenance

After construction of the multilevel intake structure, the Corps would continue to operate and maintain the dam. Operation and maintenance of the multilevel intake structure would be the responsibility of KRCD. The intake structure would require periodic maintenance of the proposed gates, gate seals around each of the gate openings, nine hoist and cable assemblies, nine motors (at the top of the three space frames), and nine new trashracks. Replacement of the motors every 20 years, and painting and priming of the structural members for rust control every 10 years, will be performed over the life of the project. The existing operation and maintenance (O&M) agreement between the Corps and KRCD would be revised to include the O&M requirements and responsibilities associated with the multilevel intake structure.

2.2.3 Byrd Slough Habitat Restoration

Selection of Design

Three designs were developed to meet the study's ecosystem restoration objectives. Each design would have a different habitat restoration value and cost, depending on the types of features. A cost effectiveness and incremental cost analysis of the designs is included in Appendix D in the main Feasibility Report.

The minimum level of restoration would consist of repairing perimeter fences, installing revegetation signs, and allowing natural regeneration of vegetation at the site. This design was identified as the most cost-effective design based on the analysis of habitat values and costs. However, since success of natural regeneration depends on environmental factors, this design would take significantly longer to achieve the restoration objective of increasing riparian and SRA habitat than the other designs.

The moderate level of restoration is the same as the minimum level, but also includes planting restoration species at 250 plants per acre, installing wildlife habitat enhancement structures, and designing and constructing an irrigation system at the site. This design would meet the restoration objective and provide the greatest habitat value. Since this design is also strongly supported by the non-Federal sponsor, it was evaluated in detail as the alternative plan.

The maximum level of restoration is the same as the moderate level, but includes planting the restoration species at a higher density of 500 plants per

acre without irrigation. This design would meet the restoration objective but provide less habitat value than the moderate level.

Features

This alternative consists of restoring a publicly owned site along the lower Kings River near the Friant-Kern Canal siphon. The site encompasses 143.5 acres of land contiguous to Byrd Slough, a relatively natural side channel of the Kings River. The land, which is currently owned by Fresno County, has been leased for cattle grazing in the past and is in a degraded condition. The U.S. Bureau of Reclamation owns about 120 acres along the north edge of the property and 700 acres to the east, and plans to restore riparian values on their parcels. Restoration at the Bureau site may include riparian forest and shrub, SRA, emergent marsh, and threatened and endangered species habitats. Restoration of the Byrd Slough site would include restoring riparian, SRA, and oak woodland vegetation, and fish and wildlife habitat along the Kings River (see Plates 5 and 6).

The restoration work would involve repairing perimeter fences, excluding cattle from the restoration areas, planting restoration species (250 plants per acre), designing and constructing an irrigation system to planted areas, installing a revegetation sign at a fishing access parking area, and installing wildlife habitat enhancement structures (Corps, 1998a). In order of priority, these structures could include brush piles, bluebird boxes, bat boxes, raptor perches, wood duck boxes, and/or songbird perches. Public access to the restoration site and the Kings River would be provided. The staging area for equipment and materials would encompass approximately 1 acre (see Plate 8). The staging area would be located in an open grassland area within the restoration site, with little vegetation or wildlife use. The staging area would also be at least 100 yards from any waterway.

Accomplishments

Repairing perimeter fences and excluding cattle would allow natural revegetation of mixed riparian areas and help to ensure survival of the oak woodland plantings at the restoration site. Planting restoration species (250 plants per acre) would help to restore riparian and SRA habitat, and increase oak woodland along the Kings River. The irrigation system would promote quicker regeneration of native plant species. The revegetation sign would help inform and educate the public and protect natural areas. Riparian habitat supports the densest and most diverse wildlife communities in the area, and installation of the wildlife habitat enhancement structures would increase nesting and foraging habitat for specific species at the site. Incidental recreation benefits would include fishing access to the Kings River, bird watching, and nature study.

Near the Friant-Kern Canal siphon crossing of the Kings River, the U.S. Bureau of Reclamation owns a 700-acre parcel, and to the north it owns a 120-acre parcel on which it plans to restore riparian habitat. The Byrd Slough restoration site is situated adjacent to the parcels owned by the Bureau. If developed, these three parcels would provide a large contiguous parcel of land, which could provide optimal riparian and SRA habitat values to wildlife populations for feeding and breeding.

Operation and Maintenance

The revegetation of the restoration site would require no regular operation. However, there would be a 3-year establishment period (with monitoring) implemented by the Corps to ensure the survival of the riparian areas and oak-woodland plantings. In addition, the fences, irrigation system, revegetation sign, and wildlife enhancement structures would require regular inspection and maintenance. No irrigation is anticipated beyond the 3-year establishment period. The groundwater table and sloping drainage should be sufficient to sustain the planted riparian species beyond the initial establishment period. At the end of the establishment period, the non-Federal sponsor would assume responsibility for long-term maintenance activities at the site. KRCD would be responsible for this maintenance (after the first 3 years) for the life of the project.

2.2.4 Combined Restoration Plan

The combined restoration plan would include the multilevel intake structure and Byrd Slough habitat restoration alternatives, including both designs, features, accomplishments, and O&M.

2.3 COMPARATIVE EFFECTS AND MITIGATION OF THE ALTERNATIVES

The evaluation of the effects of the alternatives includes both direct and indirect effects. Direct effects would result immediately from constructing and operating the project. Indirect effects would result from the effects of the project on regional growth patterns in the study area. These effects were evaluated by comparing environmental conditions with the alternatives to the likely conditions without the alternatives. Table 2-1 summarizes the direct environmental effects of the alternatives, including no action. Chapter 4 describes these effects in detail.

Mitigation for all direct effects of the alternatives would be a joint responsibility of the Corps and the non-Federal sponsor on a cost-shared basis. The direct significant effects and mitigation measures to avoid, minimize, or compensate for these effects are summarized in Tables 2-1 and 2-2 and are discussed in detail in Chapter 4 and Section 5.6. No Action is not included in this table because no project mitigation would be needed.

2.4 ENVIRONMENTAL COMMITMENTS

Environmental commitments are defined as the required measures, particularly mitigation measures, incorporated into projects as approved by the Corps (Corps, 1998b). These commitments are related to the mitigation measures and environmental monitoring described in this EIS/EIR.

Commitments related to direct environmental effects would be implemented during (1) pre-construction engineering and design, (2) project

Table 2-1. Summary of Environmental Effects

Affected Environment	No Action	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Topography, Geology, and Soils	No change from current trends.	No change.	Temporary disturbance.	Temporary disturbance.
Noise	Noise levels would be the same as existing conditions.	Temporary increase in noise levels during construction.	Temporary increase in noise levels during construction	Temporary increase in noise levels during construction
Esthetics and Visual Setting	No change from current trends.	Temporary effects and some permanent changes to the viewshed.	Temporary effects and some permanent changes to the viewshed.	Temporary effects and some permanent changes to the viewshed.
Socioeconomics	Population would continue to increase.	No change from current trend is expected.	No change from current trend is expected.	No change from current trend is expected.
Recreation	Fishery resources may decline further, degrading the recreational experience.	Fishery resources would increase, enhancing the recreational experience. Some temporary disturbance would reduce the quality of recreation during construction.	Fishery resources would increase, enhancing the recreational experience.	Fishery resources would increase, enhancing the recreational experience. Some temporary disturbance would reduce the quality of recreation during construction.
Hazardous, Toxic, and Radiological Waste (HTRW)	No HTRW sites are known at this time.	No HTRW sites are known at this time.	No HTRW sites are known at this time.	No HTRW sites are known at this time.
Traffic	Traffic volumes on Pine Flat Dam Road, Trimmer Springs Road, and Piedra Road may increase in the future.	Effects would be temporary and of short duration. Traffic volumes on Pine Flat Dam Road and Trimmer Springs Road may increase by an insignificant amount.	Effects would be temporary and of short duration. Traffic volumes on Piedra Road may increase by an insignificant amount.	Effects would be temporary and of short duration. Traffic volumes on Pine Flat Dam Road, Trimmer Springs Road, and Piedra Road may increase by an insignificant amount.
Vegetation and Wildlife	There would be no significant changes from existing conditions at the reservoir or along the lower Kings River.	Temporary, minor, construction-related disturbances would occur.	Temporary, minor, construction-related disturbances would occur in the short-term, but in the long-term overall wildlife habitat values would be increased.	Temporary, minor, construction-related disturbances would occur in the short-term, but in the long-term overall wildlife habitat values would be increased.
Fisheries	Fishery resources would decline due to high water temperatures in late summer and early fall in normal, dry and critically dry	Temporary, minor disturbances would occur during construction of the multilevel intake structure in the short-term, but in the long-	Fishery resources could be indirectly improved. Riparian habitat would regenerate along the lower Kings River.	Consists of a combination of the direct effects of the multilevel intake structure and indirect effects of the Byrd Slough habitat

Affected Environment	No Action	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
	water conditions.	term, overall fish habitat values would be increased.		restoration to fish resources.
Special Status Species	Habitat conditions would likely continue to decline without further protection.	The bald eagle and Swainson's hawk may be temporarily disturbed. Foraging habitat for the bald eagle may improve due to increased fishery.	The valley elderberry longhorn beetle, California red-legged frog, little willow flycatcher, Swainson's hawk, San Joaquin wooly threads, palmate-bracted bird's –beak, Hoover's Eriastrum, California jewel lower, tree-anemone, and San Joaquin Adobe Sunburst would be avoided. Habitat for listed species would be increased.	The bald eagle and Swainson's hawk may be temporarily disturbed. Foraging habitat for the bald eagle may improve due to increased fishery. Any listed species that may be adversely affected would be avoided at the Byrd Slough restoration area. Habitat for listed species would be increased
Water Quality	Surface and ground- water quality would not change.	The proposed project would not have any adverse effects on water quality since best management practices would be implemented.	The proposed project would not have any adverse effects on water quality since best management practices would be implemented. Water quality may be indirectly improved by restoration in the long-term.	The proposed project would not have any adverse effects on water quality since best management practices would be implemented. Water quality may be indirectly improved by restoration in the long-term.
Air Quality	Local emission rates would not change and may improve over time with stricter standards.	Adverse air quality effects would be minor, temporary, and short-term.	Adverse air quality effects would be minor, temporary, and short-term.	Adverse air quality effects would be minor, temporary, and short-term.
Land Use/Prime and Unique Farmland	Flood control, water conservation, hydroelectric power generation, and recreational development would occur as described in current city and county plans.	No change from current trends.	143.5 acres acquired by non-Federal sponsor; oak woodland vegetation plantings; riparian vegetation naturally regenerated; grazing would be discontinued.	143.5 acres acquired by non-Federal sponsor; oak woodland vegetation plantings; riparian vegetation naturally regenerated; grazing would be discontinued.
Cultural Resources	No change.	No adverse effects to cultural resources would occur.	No adverse effects to cultural resources would occur.	No adverse effects to cultural resources would occur.

Table 2-2. Summary of Environmental Commitments and Mitigation

Affected Environment	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Topography, Geology, and Soils	There would be no significant adverse effects to topography, geology, and soils due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to topography, geology, and soils due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to topography, geology, and soils due to this alternative; therefore, no mitigation would be needed.
Noise	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.

Affected Environment	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
Esthetics and Visual Setting	There would be no significant adverse effects to esthetics and visual setting due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to esthetics and visual setting due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to esthetics and visual setting due to this alternative; therefore, no mitigation would be needed.
Socioeconomics	There would be no significant adverse effects on socioeconomic trends due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on socioeconomic trends due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on socioeconomic trends due to this alternative; therefore, no mitigation would be needed.
Recreation	There would be no significant adverse effects on recreation due to this alternative; therefore, no mitigation would be needed. The recreational experience may be improved by this alternative.	There would be no significant adverse effects on recreation due to this alternative; therefore, no mitigation would be needed. The recreational experience may be improved by this alternative.	There would be no significant adverse effects on recreation due to this alternative; therefore, no mitigation would be needed. The recreational experience may be improved by this alternative.
Hazardous, Toxic, and Radiological Waste (HTRW)	Any discovered HTRW affected by this alternative would be remediated according to applicable Federal, State, and local regulations.	Any discovered HTRW affected by this alternative would be remediated according to applicable Federal, State, and local regulations.	Any discovered HTRW affected by this alternative would be remediated according to applicable Federal, State, and local regulations.
Traffic	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.
Vegetation and Wildlife	There would be no significant adverse effects on vegetation and wildlife due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects to vegetation and wildlife due to this alternative; therefore, no mitigation would be needed. Vegetation and wildlife resources would be increased/improved as a result of this alternative.	There would be no significant adverse effects to vegetation and wildlife due to this alternative; therefore, no mitigation would be needed. Vegetation and wildlife resources would be increased/improved as a result of this alternative.
Fisheries	Conditions for fisheries would be improved from without-project conditions; therefore, no mitigation for fisheries would be needed.	There would be no significant adverse effects to fisheries due to this alternative; therefore, no mitigation would be needed.	Conditions for fisheries would be improved from without-project conditions; therefore, no mitigation for fisheries would be needed.
Special Status Species	Foraging conditions for the bald eagle would be improved. No mitigation for listed species is needed.	Habitat for listed wildlife species would be increased and improved. The California red-legged frog and listed plant species would be avoided. Pre-construction surveys would be conducted to avoid listed sensitive species or critical habitats. No mitigation for listed species is needed.	Habitat for listed wildlife species would be increased and improved. Foraging conditions for the bald eagle would be improved. The California red-legged frog and listed plant species would be avoided. Pre-construction surveys would be conducted to avoid listed sensitive species or critical habitats. No mitigation for listed species is needed.
Water Quality	There would be no adverse effects due to this alternative since best management practices	There would be no adverse effects due to this alternative since best management practices	There would be no adverse effects due to this alternative since best management practices

Affected Environment	Multilevel Intake Structure	Byrd Slough Habitat Restoration	Combined Restoration Plan
	would be implemented; therefore, no mitigation would be needed.	would be implemented; therefore, no mitigation would be needed.	would be implemented; therefore, no mitigation would be needed.
Air Quality	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.	Temporary short-term construction effects would be mitigated through best management practices.
Land Use/Prime and Unique Farmland	There would be no significant adverse effects on land use due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on land use due to this alternative; therefore, no mitigation would be needed.	There would be no significant adverse effects on land use due to this alternative; therefore, no mitigation would be needed.
Cultural Resources	There would be no adverse effects to cultural resources; therefore, no mitigation would be needed.	There would be no adverse effects to cultural resources; therefore, no mitigation would be needed.	There would be no adverse effects to cultural resources; therefore, no mitigation would be needed.

construction, or (3) O&M. Pre-construction engineering and design begins prior to project authorization and extends until all project-related plans and specifications are completed. This process includes preparation of detailed mitigation plans and ongoing coordination with other agencies. The acquisition of all easements, rights-of-way, and relocations included in any project mitigation measure is the responsibility of the non-Federal sponsor. During construction, the Corps is responsible for administering project construction contracts and for ensuring that the mitigation measures included in these contracts are carried out. After completion of the project, the non-Federal sponsor is required to maintain the improvements. The Corps prepares the O&M manual, which the District and the non-Federal sponsor are responsible for implementing.

The environmental commitments to mitigate the direct effects of the project alternatives are listed below.

Noise

- During project construction, noise-generating equipment will be limited to work during daytime hours only. Additionally, all mobile equipment will be fitted with mufflers consistent with the best noise reduction technology.

Traffic

- Construction and restoration activities will not close or block a roadway or block emergency vehicle access. Precautions such as posted construction zones, reduced speed limits, flagmen, off-street parking, and construction quality control monitors will be taken to ensure public safety on the roadways. Any damage to roadway surfaces from the operation of heavy equipment will be repaired.

Special Status Species

- Pre-construction surveys will be conducted by qualified biologists at the Byrd Slough restoration site. Any special status plant species or potential critical habitat discovered during these surveys will be fenced, flagged, and avoided during restoration activities. In addition, workers will undergo awareness training, and a qualified monitoring biologist will be onsite during restoration activities.

Water Quality

- Best management practices will consist of regular watering of construction surfaces with water trucks to prevent wind erosion of dust into water resources, temporary berms to prevent materials from eroding in or near water resources, refueling equipment in designated areas, monitoring and maintaining equipment for fuel leaks regularly, and reseeding soil areas with native grass to prevent soil erosion from surface water runoff. A water quality monitoring program, which consists of water testing, will be conducted by the construction contractor and KRCD to alert construction representatives if levels of pollutants have increased above standards set by the U.S. Environmental Protection Agency (EPA) and Regional Water Quality Control Board.

Air Quality

- During project construction, the best management practices listed in Section 4.5.5 for combustion emissions and particulates (PM_{10}) will be implemented to reduce any emissions to less than significant. All standard practices and procedures set by the San Joaquin Unified Air Pollution Control District, the Air Resources Board, and the guidelines provided by the U.S. EPA to minimize emissions will be used during construction.

- Construction contracts will be scheduled by the Corps so as not to exceed daily (pounds per day) local and State air quality thresholds in Fresno County for nitrogen oxides, carbon monoxide, and PM_{10}.

- To decrease the amount of dust and PM_{10}, unpaved haul roads, staging areas, and stockpile areas will be watered to keep them moist.

2.5 SELECTED PLAN

The Selected Plan is the combined restoration plan as described in Section 2.2.4.

CHAPTER 3.0

AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the existing environmental resources that could be affected if any of the alternatives were implemented. Only those environmental resources relevant to the decisions to be made are discussed in detail.

3.2 ENVIRONMENTAL RESOURCES ELIMINATED FROM DETAILED ANALYSIS

Effects on several environmental resources were evaluated during the initial scoping process and found to be minor and insignificant. These resources are described below along with the reasons for eliminating them from detailed analysis.

3.2.1 Topography, Geology, and Soils

The study area lies within the southern portion of an elongated lowland known as the Central Valley. The Central Valley is a large asymmetrical trough between the Sierra Nevada and the Coast Ranges in central California. The valley is unusual for a lowland because it is a relatively undeformed basin surrounded by highly deformed rock units (Corps 1996b). This valley area is separated into two segments: the Sacramento Valley to the north and the San Joaquin Valley to the south. The Pine Flat Dam and Byrd Slough restoration sites are located on the eastern edge of the San Joaquin Valley near the western slope of the Sierra Nevada.

The Kings River canyon in the area of Pine Flat Lake is fairly steep. The topography above the dam is steep mountainous terrain. Below the dam, foothills transition into an alluvial fan, and flatlands slope into the Tulare Lakebed. Elevations range from about 10,000 feet in the mountains to 972 feet at the top of Pine Flat Dam to 175 feet in the Tulare Lakebed region. The upland areas are relatively flat with slight undulations. The Byrd Slough restoration site slopes generally from northeast to southwest, with an elevation of about 441 feet, m.s.l., in the northeast corner and 420 feet at the southernmost end of Byrd Slough. The site has a high water table, which has supported a variety of vegetation through previous drought periods. The original topography of the restoration site has been altered in some areas by land leveling and the construction of drainage and irrigation systems. Byrd Slough cuts a channel from northeast to southwest through the middle of the site.

The Kings River basin is within a complex geologic area containing metamorphic, sedimentary, and volcanic rocks that have been folded, faulted,

and intruded upon by granitic rocks of three different ages. In addition, volcanism and glaciation have modified the topography to essentially the current landscape. Around Pine Flat Lake, the geology is similar to that of the rest of the western slope of the Sierra Nevada, with Mesozoic granitic rocks and pre-Mesozoic metamorphic and granitic rocks predominating. Small amounts of Quarternary alluvium cover the canyon floor.

No major fault zones are known to exist within the basin. The closest major faults are the Independence and Owens Valley Faults east of the Sierra Nevada. An unnamed fault trends northwest and parallels the base of the foothills near Piedra. The seismic history of the area indicates a general absence of both earthquake epicenters and large-intensity shocks due to tremors.

Soil information has been obtained from the Natural Resources Conservation Service. The information consists of the Soil Survey of the Eastern Fresno Area, California, dated October 1971. Soils in the lower Kings River are sandy loam formed from soils washed down from the upper river canyons. These soils vary in depth, and most are well drained and ideal for farming. The soils in the Kings River North and Kings River South areas are predominantly heavy soils, which were formerly crossed by many channels and sloughs. Some of the soils in the Tulare Lake area are of lesser quality and have drainage problems.

No soil resources would be affected by installing the multilevel intake structure. The restoration site would have minor disturbance of surface soils. However, no soils would be lost, and the types of soils in the area would not change.

3.2.2 Noise

Community noise is commonly described in terms of the ambient noise level which constitutes the normal or existing level of environmental noise at a given location. The unit of measure for sound is the decibel (dB), which describes the amplitude of sound. Day-night average decibel levels (L_{dn}) show a very good correlation with community response to noise.

In order to determine existing noise conditions in the study area, the most recent Noise Element of the Fresno County General Plan has been reviewed. The element contains policies and noise-level criteria, which are consistent with current State requirements and noise-level descriptors. Existing and anticipated noise levels and sources are identified. Objectives and policies necessary to achieve and maintain acceptable noise exposure levels have been established (Fresno County, 1975).

In order to maintain an acceptable noise environment, Fresno County has established maximum acceptable noise levels for various land use designations. In rural residential areas, for example, the exterior L_{dn} is 55 dBA (dB weighted for human sensitivity), and the interior L_{dn} is 45 dBA. The major noise sources in Fresno County are highways, railroads, and airport traffic; manufacturing and industrial plants; and agricultural equipment. Except for certain noise-sensitive uses or near major transportation facilities, only limited monitoring has been done to determine the noise environment of sensitive uses. Noise-sensitive land uses include educational facilities, medical, nursing, and mental care facilities; residential areas; churches; hotels and motels; outdoor sports and recreation facilities; and business and professional offices.

Major sources of noise at Pine Flat Reservoir are dam operations, traffic, and boating. In the foothill and mountain areas, background noise levels are generally very low. Exceptions occur near major roadways or along rivers and streams where running water may be a significant source of sounds. Noise levels are somewhat lower during the late night and early morning hours when traffic and boating are at a minimum. Noise-sensitive land uses include outdoor sports and recreation facilities.

Significant sources of noise in the lower Kings River area include State and county highways, private airports, railroads, and agricultural activities. Other sources of noise include the flow of water from the Kings River and Byrd Slough; recreationists partaking in activities such as boating, fishing, swimming, and picnicking; and minor traffic on Piedras and Trimmer Springs Roads, which lead to Pine Flat Dam. Noise-sensitive land uses include scattered residences and outdoor sports and recreation facilities.

The major sources of noise at the Byrd Slough restoration site are water flowing down Byrd Slough, nearby traffic, and agricultural activities. Some of the more common noise sources associated with farming include tractors, harvesting equipment, spray equipment, processing operations, aerial crop-dusters, and stationary power sources including internal combustion pump engines. Decibel values in agricultural areas commonly range from 75 to 85 dBA. There are no noise-sensitive land uses at the site; sensitive receptors include wildlife and a few recreationists.

Although noise levels would be temporarily increased during construction, none of the alternatives would have long-term adverse effects on noise levels in the area. There are no urban land uses at or near the two sites, and scattered residences and developed recreational facilities are located away from the proposed work areas. Occasional recreationists at the Byrd Slough restoration site and residents near Pine Flat Dam could be aware of slightly increased noise levels, but any effect would not be considered to be significant.

3.2.3 Esthetics and Visual Setting

An area's visual character is determined by the variety of the existing visual features, the quality of those features, and the scope and scale of the scene. The visual components of a particular area consist of such features as landforms, vegetation, manmade structures, and land use patterns. The quality of these features depends on the relationship between them and their scale in the overall scene.

Visual analysis involves a degree of subjective evaluation based on the perception of the observer. Variety in a particular landscape and the relative value of the feature components differ according to the perceptions of the individual observer. For example, areas with the greatest variety of features (steep slopes, large exposed ridges, varied vegetation, or water forms) are commonly considered to have the highest relative value among observers. In addition, the visual sensitivity of the site must be considered. Areas of high visual sensitivity are highly visual to the general public. These often include scenic highways, tourist routes, and recreation areas.

The study area consists of two diverse regions: the predominantly agricultural area of the lower Kings River and the upland area of Pine Flat Dam. The dam is a distinct visual feature that occupies the upper reach of the lower Kings River canyon. The surrounding hills and mountains are characterized by scattered oak woodlands and grasslands. The river corridor leading to the dam is a meandering greenway mixed with riverine riparian and SRA environments. Standing over 400 feet tall, the massive concrete structure of Pine Flat Dam is a natural curiosity for all persons who are in the immediate area. Not visible from nearby populated areas, this dam is usually viewed only upon approach, and from as far away as a few miles downstream.

During periods when reservoir conditions require the spillway gates to be open, the impressive cascade of water falling down the chutes on the face of the dam creates a thunderous roar. Just below the dam is a catch area that is enveloped in mist when the gates are open. The public can visit the top of the dam during most times of the year where additional observation of the surrounding area is possible.

The valley and Kings River corridor below Pine Flat Dam is a greenway of riparian and riverine habitats and a mixture of agricultural areas. Rural residential farms and ranches create a pastoral setting for the developed areas of the river bottom. The upper reaches of the lower river were described in 1966 as the last remaining natural interior valley river floodplain left in Fresno County (Fresno County, 1966). Just below the dam to about Fresno Weir, the Kings River is confined to a single channel lined with cottonwood forests, oak woodlands, and sycamore flats. Below Fresno Weir, the river valley widens,

forming Centerville Bottoms complete with meandering sloughs, deep pools, green pastures, and rich agricultural lands.

Sections of riparian forest, oak woodlands, and open riverine bars are common along the banks of the river to below the town of Reedley. However, the density and quality of riparian habitat gradually decreases downstream. Most of the riparian areas in the western portion of the river have been cleared, and much of the river is lined with constructed levees and dikes.

Although the visual setting would be temporarily disrupted during construction, none of the alternatives would have long-term adverse effects on visual resources in the area. The multilevel intake structure would be designed to have no adverse effect to the visual setting of Pine Flat Dam. The Byrd Slough habitat restoration alternative could benefit the visual setting by increasing the natural vegetation at the site.

3.2.4 Socioeconomics

This section describes the existing socioeconomic conditions in Fresno County, including population, employment, housing, public services, and water rights. This discussion is based on State statistics, Federal census data, and city and county general plans. Although statistical data are often based on the 1990 Census, an attempt was made to provide more recent information, when available.

The population of Fresno County increased from 774,200 in 1997 to an estimated 786,800 in 1998, an increase of about 1.0 percent (California Department of Finance, 1998). The population is projected to grow to nearly 1,506,000 by the year 2020, an estimated increase from 1998 of over 90 percent. The population of the county has increased at a faster rate than the State (U.S. Bureau of the Census, 1996).

The largest cities in the county are Fresno (411,600) and Clovis (67,700). Smaller cities include Reedley (20,200), Sanger (18,800), Selma (18,100), Mendota (7,600), and Kerman (7,400) (California Department of Finance, 1998). Many people reside in unincorporated areas (178,700), which include many small towns. The ethnic composition of these populations is diverse, and the hispanic population was about 35.3 percent in 1990, which was 10.3 percent higher than the 25.8 percent estimate statewide (U.S. Bureau of the Census, 1990).

The major components of the economic base of Fresno County are agriculture and related activities; business, health, and other services; wholesale and retail trade; Federal, State, and local government; and manufacturing. Fresno County is the leading agricultural county, not only in California but also in the United States, with a yearly gross crop value exceeding $3 billion (California Employment Development Department, 1997). Over 250 different commodities

are grown commercially in the county, including garlic, melons, onions, tomatoes, grapes, nectarines, peaches, and cotton (California Department of Finance, 1998; Fresno City and County, 1998). While agriculture will continue to support the county's financial base, Fresno County is diversifying into a broad range of industries which now provides about 87 percent of the non-agricultural wage and salary jobs (Economic Development Corporation, 1998).

The total civilian labor force in the county is 377,300 (California Department of Finance, 1998). According to the Fresno County Farm Bureau, one in every three jobs in the county is related to agriculture (Fresno Chamber of Commerce, 1998). Although agriculture is the leading employer in Fresno County, a large percentage of the workforce is seasonal. This seasonal work contributes to a high unemployment rate, which in 1997 was 13.2 percent for the county (California Department of Finance, 1998). The per capita personal income for Fresno County for 1998 was $20,333, as compared to $28,163 for the entire State for the same year.

Currently, there are an estimated 268,217 housing units in Fresno County, including single, multiple family, and mobile homes. The vacancy rate is 6.1 percent, and the population per household is about 3.0 persons (California Department of Finance, 1998). In 1990, there were 235,563 housing units in Fresno County, and the median value of a single family home was $83,600 (U.S. Bureau of the Census, 1990). The number of housing units in the county is expected to increase to accommodate future growth.

Fire protection in Fresno County is provided by several agencies, reflecting the fact that there are city, county, State, Federal and privately owned lands in the county. The incorporated cities provide their own fire protections services, while unincorporated areas are included in the Fresno County Fire Protection District. The State Department of Forestry generally provides fire protection in the unincorporated foothill and rural portions of the county that fall within the responsibility of the State (Council of Fresno County Governments, 1999).

The Fresno County Sheriff's Department, headquartered in Fresno, provides law enforcement and police protection throughout the unincorporated area of the county. In 1996, there were 362 sworn officers in the Department (Hornor, 1998), and the staffing ratio of sworn personnel to the service area population was about 1.3 officers per 1,000 people. The incorporated cities provide their own law enforcement services.

The water rights within the Kings River basin are governed by a collective agreement executed in 1927 by the individual water right holders. The agreement has been modified through the years, and today it is administered by the KRWA for the 28 members who collectively own all the water rights in the basin. The water is distributed through the many canals, channels, ditches, and

pipelines downstream, and is used primarily for irrigation in the 1.1 million-acre Kings River service area. In years of abundant water supply, significant amounts of Kings River water are used for ground-water recharge.

Construction of any of the alternatives would not be expected to affect the socioeconomic conditions in the study area. The two alternatives are located in rural areas of Fresno County. The multilevel intake structure would be constructed on project land at the dam. The riparian, SRA, and oak woodland habitat restored near the Kings River would only disrupt cattle grazing or incidental recreation on a small area. Residential, commercial, industrial, and agricultural development would continue according to city and county general plans and regulations. The growth rates, employment opportunities, and housing values would be determined by local government regulations, as well as regional economic conditions. Public services would be expanded to support the planned increases in population and needs of the residents. As a result, the socioeconomic effects would be considered to be insignificant.

3.2.5 Recreation

The Pine Flat Lake and lower Kings River provide numerous recreational opportunities and developed facilities for visitors and area residents. The Byrd Slough restoration site offers public access to the Kings River with no facilities.

Pine Flat Lake contains an average recreation pool of about 4,400 surface acres. At gross pool, the lake is 20 miles long with 67 miles of shoreline. The lake provides excellent opportunities for all types of boating activities. Currently there are two commercial marinas on the lake which provide a full range of boat rentals, slip rentals, fuel, and convenience services. Mooring is available year-round. Mid-May through Labor Day is the prime recreation season. During the winter, the lake is used mostly by anglers. Bass club enthusiasts participate in the many fishing tournaments scheduled by permit.

Developed recreational areas around Pine Flat Lake include the Dam Observation Area, Pine Flat Recreation Area operated by Fresno County, Deer Creek, Island Park, Lakeview, Trimmer, Sycamore I and II Campgrounds and Lakeview Picnic Area operated by the U.S. Forest Service, and Kirch Flat operated by the U.S. Forest Service. Among the facilities provided to recreationists are parking spaces, group and individual camp sites, restrooms and potable water, picnic areas and playgrounds, trails, boat launching and mooring, boat rentals, and boating and fishing supplies.

Recreational activities on the lower Kings River include picnicking, boating, and fishing. Recreational boating is enjoyed on the river, although boating is limited from the dam to Fresno Weir. Rafting is popular, and canoes can be rented where Highway 180 crosses the Kings River. Kayakers and canoeists portage around the Fresno Weir on the south bank of the Kings River

through blackberry bushes, over a fence, and then down a concrete embankment. Fishing in the Kings River is a popular activity. Fishing access is provided at four county parks, but is restricted elsewhere because most of the land along the river is privately owned. Anglers wade upriver to the Fresno Weir from the Highway 180 bridge.

Fresno County owns and operates several developed and undeveloped recreational areas along the lower Kings River, including Choinumni Park, Winton Park, Avocado Lake Park, Kings River Green Belt Park, and China Creek Park. In addition, Pierce's Park is a privately owned park located at the State Highway 180 bridge, and Reedley Beach is located in the city of Reedley. These parks offer camping, picnicking, hiking, fishing, swimming, boating, and rafting (Vance, 1998).

The Byrd Slough restoration site is part of the Kings River Green Belt Park, which is owned by Fresno County. The park is an undeveloped recreation area, and the county does not anticipate any recreational development in the near future. Light recreation use occurs at this park, and there are no facilities. Anglers wading upstream from State Highway 180 pass through the area, and a few boaters use a portion of the Kings River Green Belt Park for portage to avoid the Fresno Weir. Infrequent recreational activities might include sightseeing, but there are no facilities (JSA, 1998b).

Construction of any of the alternatives would not be expected to adversely affect the recreational opportunities or facilities in the study area. Use of the lake and surrounding developed areas would not be disrupted during construction of the multilevel intake structure. Access to the construction area at the dam would be restricted to ensure public safety. Anglers, boaters, and picnickers would still enjoy reaches of the lower Kings River as they do now, with no change at any of the county and private parks. Public access would likely be controlled during restoration and management of the Byrd Slough restoration site. However, current use is small, and the effect would be short term.

In addition, recreation could benefit long term from the alternatives. For example, cooler water temperatures in the lower Kings River would be expected to enhance the coldwater fishery, increasing the potential success of fishing. Seasonal changes in flows in the lower river could also enhance picnicking and recreational boating opportunities. After restoration at the Byrd Slough site, there would be additional opportunities for recreationists to enjoy fishing, nature study, birding, and wildlife observation at the site.

3.2.6 Hazardous, Toxic, and Radiological Waste

The Corps policy guidance pertaining to hazardous, toxic, and radiological waste (HTRW) is outlined in Engineering Regulation 1165-2-132 dated June 1992. This policy provides guidance for HTRW, which may be located with

project boundaries or may affect or be affected by Corps civil work projects. Furthermore, it states that each civil works project will routinely include a phased and documented review to provide for early identification of HTRW potential at civil works project sites. Where HTRW contaminated areas or effects cannot be avoided, response actions must be acceptable to the U.S. EPA and applicable state regulatory agencies. For cost-shared projects, it is the non-Federal sponsor's responsibility for ensuring that the development and execution of Federal, State and/or locally required HTRW response actions are accomplished at 100 percent non-project cost.

A survey and assessment of potential HTRW sites was conducted by GEOFON, Inc., for the Pine Flat Dam restoration project (GEOFON, 1997). The Byrd Slough restoration site was assessed in the GEOFON report. Additionally, GEOFON contracted with Environmental Data Resources, Inc., to conduct database searches of areas within 1 mile of the Byrd Slough restoration site. The database review and searches were conducted to identify reported HTRW sites or potential sites within that area. GEOFON's contractor searched databases of Federal and State agencies with lists of known or suspected contaminated sites, known handlers or generators of hazardous waste, known waste disposal facilities, and permitted underground storage tanks.

GEOFON also performed onsite surveys at the Byrd Slough restoration site. Additionally, nearby streets were surveyed for possible offsite polluters such as oil suppliers and distributors, crop dusting firms, gas stations, or any company or farm with underground storage tanks. Possible offsite polluters were documented due to the possibility of contaminant plumes in the soil or the presence of ground water underneath the HTRW. The GEOFON report was prepared in compliance with Engineer Regulation 1165-2-132.

The GEOFON report found no indication that HTRW would affect the Pine Flat Dam restoration project. The sites were not listed in any of the databases, and no risks to public health or safety, or to the environment were identified at the site (Corps 1994b, 1997; GEOFON, 1997).

3.2.7 Traffic

Fresno County is served by a system of freeways, State highways, and county and local roads. The current highways in the region are Interstate 5 and State Routes (SR) 33, 41, 99, 145, 168, and 180. The major highway in the study area is SR 180, which runs east-west across Fresno County. SR 180 is functionally classified as a Minor Arterial in the rural areas east of Fresno. The highway exhibits low traffic volumes through the rural areas. County and local roadways have two lanes and exhibit low traffic volumes.

The Byrd Slough restoration site is located near the town of Centerville, which is east of Fresno on SR 180. The restoration site can be accessed by

traveling northeast from Centerville on Piedra Road. Pine Flat Dam can be accessed by continuing northeast on Piedra Road, east on Trimmer Springs Road, and then east on Pine Flat Road.

The proposed alternatives would have temporary effects on traffic near the work areas. These effects include minor increases in traffic volumes and reduced public access due to construction worker vehicles and haul trucks traveling to and from the construction and restoration areas. However, the project would be designed and scheduled so that construction would not close or block a roadway or block emergency vehicle access. Precautions such as posted construction zones, reduced speed limits, flagmen, off-street parking, and construction quality control monitors would be taken to ensure public safety on the roadways. These precautionary requirements would be included in the construction contractors contract. The construction contractor would also be responsible for any damage to roadway surfaces resulting from the operation of heavy equipment and would be required to return road surfaces to pre-project conditions. As a result, there would be no significant adverse effects on traffic.

3.3 AFFECTED ENVIRONMENT

3.3.1 Vegetation and Wildlife

This section describes the historic and existing vegetation and wildlife resources in the study area. Additional information is included in the draft U.S. Fish and Wildlife Services (FWS) Coordination Act Report (CAR), which is included as Appendix A.

Historic Conditions

Vegetative communities and associated wildlife found in the area prior to construction of Pine Flat Dam were similar to those found in this area today. Foothill woodland (including oak bottom), valley grassland, and riparian forest were the dominant native habitat types in this area. The upland portion of the Kings River basin was fairly dry. Aerial photographs taken before Pine Flat Dam was built show that the river flooded regularly. Riparian vegetation including willow, cottonwood, and pines grew in relatively narrow strips and patches mixed with gravel bars along the reservoir site.

Existing Conditions

Pine Flat Reservoir. Vegetation surrounding Pine Flat Reservoir is typical of the Upper Sonoran life zone. The dominant species in this foothill woodland area are interior live oak, blue oak, yellow, foothill pine, and California buckeye. These species give the area the characteristic open woodland appearance to the mountain side above the lake. Other trees in the general lake area are willows, California sycamore, and poplar. Dispersed among the trees are understory

shrubs of chamise, ceanothus, yerba santa, and manzanita. Common grasses are pine bluegrass, wild oats, and needlegrass. During low lake levels, some of the steep slopes of the reservoir are often covered with annual grasses and weeds. The grasses are the same annuals that make up the ground cover above the high-water level.

A number of mammals live in or are transient through the Pine Flat Dam area. The largest mammal presently in the project site is the mule deer. The North Kings deer herd winters in the area east of Trimmer and numbers more than 5,000 head. Other mammals include the raccoon, skunk, gray fox, wild pig, bobcat, coyote, California ground squirrel, and opossum.

Bird species frequently seen around the lake include the red-tailed hawk, golden eagle, Anna's hummingbird, acorn woodpecker, flicker, house finch, and rufous-sided towhee. Game birds include the California quail, wild turkey, and mourning dove. Although food for aquatic species of birds is not plentiful, some species such as eared grebe, common merganser, and osprey frequent the lake. Other species that are usually seen in the late fall and winter include the coot, pintail, widgeon, western grebe, pied-billed grebe, great blue heron, and California gull. Most of these waterfowl species do not stay long in this area. Bald eagles also winter along the Kings River and the reservoir.

Various species of reptiles and amphibians inhabit the lake's surrounding foothills. Common reptiles and amphibians in the area include the California newt, western treefrog, bullfrog, western pond turtle, western fence lizard, sagebrush lizard, rubber boa, common kingsnake, and western rattlesnake.

Lower Kings River. Vegetation between Pine Flat Dam and the Friant-Kern Canal is characterized by a thin band of riparian vegetation with a cottonwood-sycamore overstory. Willows, blackberries, and poison oak are found near the water's edge. Sloughs within this reach are wetland in nature due to the high water table and contain typical emergent marsh vegetation. Outside of this corridor, most land has been converted to orchards, grasslands for livestock grazing, and a few scattered residences.

Byrd Slough Habitat Restoration Site. The restoration site includes about 143.5 acres and is bordered by Alta Main Canal on the east side and the Kings River on the west side. Byrd Slough bisects the middle of the property.

Four habitat types have been identified at the restoration site: annual grasslands (abandoned irrigation pasture), mixed riparian forest, seasonal wetlands, and stream habitat. Annual grasslands dominate the northwest and south portions of the site. Both of the grassland areas were previously irrigated pasture. The grasslands are heavily grazed.

Along Byrd Slough is a well developed mixed riparian forest. A thin band of riparian forest is also found along the margin of the Kings River and the Alta Main Canal. This habitat is dominated by valley oak, Fremont cottonwood, California sycamore, and arroyo willow as minor components. Riparian forest consists mainly of mature trees with very little regeneration, which is likely because of the long history of cattle grazing in this area. Except for blackberry shrubs, the understory vegetation in this area is sparse, primarily from the effects of cattle grazing. Blue elderberry shrubs are found in scattered areas within the riparian habitat, mainly along Byrd Slough.

Seasonal wetlands are found in several areas. Along the northern border of the property, the wetlands are within the Kings River flood plain. The wetlands contain a cobble bottom, and a flora similar to the surrounding annual grasslands. Another seasonal wetland is found in the northeast part of the site adjacent to the Alta Main Canal. This wetland consists of a swale and seasonally ponded wetland complex. It is topographically higher than the Alta Main Canal and appears to be hydrologically separate. The swale contains hydrophytic vegetation as well as upland vegetation similar to the adjacent grasslands. The ponded area is over 1 foot deep and contains tules, smartweed, and other hydrophytes.

Open water is found at Byrd Slough, Alta Main Canal, and the Kings River. There are several wood duck nest boxes along the slough, and wood ducks and mallards have been observed in the water. A list of wildlife seen in field surveys at the Byrd Slough Restoration Site is included in Table 3-1. In the Kings River adjacent to the restoration site, KRCD staff have initiated enhancement activities to improve habitat for coldwater fish. Several large boulders have been placed in the river to create hiding cover for coldwater fish.

Table 3-1. Species Seen during Field Surveys at the Byrd Slough Restoration Site

Double-crested cormorant	Black phoebe	Spotted towhee
Great blue heron	Tree swallow	Lark sparrow
Wood duck	Western scrub jay	Savannah sparrow
Mallard	American crow	Song sparrow
Turkey vulture	Plain titmouse	White-crowned sparrow
Red-shouldered hawk	Common bushtit	Dark-eyed junco
Red-tailed hawk	White-breasted nuthatch	Western meadowlark
American kestrel	Bewick's wren	Brewer's blackbird
Killdeer	House wren	House finch
California quail	Ruby-crowned kinglet	American goldfinch
Great horned owl	Western bluebird	Pacific chorus frog
Mourning dove	Hermit thrush	Western fence lizard
Anna's hummingbird	American robin	Botta's pocket gopher
Lewis' woodpecker	Northern mockingbird	American beaver
Acorn woodpecker	American pipit	Black-tailed hare
Nuttalls' woodpecker	European starling	Dusky-footed woodrat
Hairy woodpecker	Yellow-rumped warbler	California ground squirrel
Northern flicker	Common yellowthroat	

Source: Jones and Stokes Associates, February 1998.

3.3.2 Fisheries

Historic Conditions

The mainstem Kings River below Pine Flat Dam falls within the elevation range of the "squawfish-sucker-hardhead" zone designated by Moyle (1976). In this reach, Sacramento sucker, Sacramento squawfish, California roach, hardhead, and other native species are known to have coexisted with rainbow trout in both pre-dam and post-dam periods. Before Pine Flat Dam was constructed, the lower river supported a variety of introduced and native species. Largemouth bass were introduced into Tulare Lake and are found today in the lower Kings River. Other gamefish in the lower river prior to construction of Pine Flat Dam included chinook salmon, smallmouth bass, and rainbow trout (both resident and anadromous or steelhead forms), in addition to native suckers and minnows (FWS, 1996).

Prior to construction of the dam, many miles of the lower river were subject to significant warming in most years, particularly in late summer and early fall as snowmelt receded. Typical fall/winter streamflows at Piedra ranged between 240 cfs and 500 cfs, while streamflows during the April to June snowmelt season ranged from 3,500 to 6,500 cfs (Trihey and Associates, 1992). The historic resident coldwater fishery was very likely seasonal, with most of the spawning and rearing in the cooler, upstream tributaries. The coldwater fish population probably recolonized the lower river quickly as a result of migration and recruitment from upstream. As such, the resident coldwater fish were never eliminated and reintroduced, but the range of their usable habitat varied

seasonally and from year to year. In the wettest years, however, there could have been suitable temperatures and flows to allow coldwater fish to survive, at least as far downstream as the riffle and run sections upstream of the town of Reedley (FWS, 1996).

The original resident coldwater fish of the lower river were very likely highly migratory and were distributed throughout the basin (including Tulare Lake) for at least part of the year, moving far upstream as temperatures warmed in late summer. This migration was blocked by construction of Pine Flat Dam. In above normal and wet years, cooler year-round water temperatures have been maintained in the lower river with the dam in place. However, the water temperatures experienced during normal or drier years with the dam in place may become lethal to coldwater fish during the summer and early fall, and the dam has prevented fish movement to cooler upstream waters available prior to dam construction.

Existing Conditions

Pine Flat Reservoir

Fisheries Habitat. Both cold and warmwater fisheries have been established at the lake. The nucleus of a good sport fishery existed prior to construction of Pine Flat Dam. After construction, DFG managed the lake as a warmwater fishery, primarily for smallmouth bass and green sunfish as a forage fish. The limited warmwater fishery is presently maintained primarily by natural propagation. Nonnative species, such as spotted bass in 1979, were introduced by DFG in an attempt to improve the fishery.

Although no minimum pool was established in Pine Flat Lake at construction, the pool rarely fell below 30,000 acre-feet due to agreements between KRWA and PG&E. In May 1999, the Kings River Fisheries Management Program Framework Agreement implemented several actions including establishment of a 100,000 acre-foot temperature control pool in the lake. Throughout the year, the lake normally fluctuates from flood control and irrigation releases. In some years the lake elevation has fluctuated as much as 160 feet between April and September. Maximum drawdown is ordinarily about 2.5 feet in a 24-hour period. Because of the steep sideslopes of Pine Flat Lake, significant elevation changes are possible in a short period. Since many warmwater fish spawn at the edge of the lake, these fluctuations often result in spawning failure.

No fish were stocked in the reservoir when water storage began in 1954. The DFG managed the lake for year-round fishing of all species. Experimental plantings of rainbow trout began in 1957, followed in 1960 by largemouth bass, white crappie, brown bullhead, and threadfin shad. Stocking has evolved into the current program of planting rainbow trout. Currently, populations of largemouth

bass, smallmouth bass, and smaller centrarchid panfish are self-sustaining and live off threadfin shad. A few exotic fish species such as white bass have been known to exist in the reservoir in the past although none have been recorded in Pine Flat Reservoir recently.

Principal game fish include rainbow trout, brown trout, kokanee salmon, small-mouth bass, large-mouth bass, bluegill, green sunfish, black crappie, white catfish, channel catfish, and brown bullhead. Trout and bass make up the bulk of the catch. The main reason for the decline of game fish in the lake has been the competition from nongame fish, primarily hardhead, Sacramento squawfish, and Sacramento sucker.

Similar to most reservoirs of its size, Pine Flat Lake stratifies into three layers, with the cooler, denser layers developing on the bottom and the warmer layers developing near the surface. The stratified lake equalizes sometime between September and November. By April, thermal stratification begins again. Bottom water temperatures are generally constant throughout the year at 45.5 ^{0}F, while surface temperatures range from 41 ^{0}F to 50 ^{0}F in the winter and 68 ^{0}F to 77 ^{0}F in late summer. Changes in the location of releases from the dam (from the mid-level conduits to the low-level sluices, for example) can alter water temperatures in the river downstream and subsequently affect coldwater fish survival.

Fish Entrainment Through Pine Flat Dam. Entrainment studies were conducted by KRCD in the late 1970's to early 1980's. Groups of 500 to 1,000 tagged trout were released in the lake and accounted for as recovered in the lake or lower river. About zero to 20 percent of the recoveries were in the river. Overall, about 5 percent of the tags were recovered in the lower Kings River when releases were made from the midlevel sluices or spillway, and none were recovered when releases were made through the power penstocks. Anglers creel census, electroshocking surveys, snorkeling surveys, and entrainment studies were also conducted by the DFG and KRCD in the mid 1990's. These surveys also indicated that entrainment from the lake under existing conditions is probably very low. Most entrained fish must pass through the penstock turbines where they usually cannot survive.

Lower Kings River

Species Composition. Fish species composition in the lower river has changed considerably since construction of Pine Flat Dam. In wetter years, coldwater reserves in the lake are maintained throughout the year, and the temperature of water released from the dam is suitable for coldwater fish. The warmwater fish typical of this elevation are probably forced to move to the warmer downstream reaches of the lower river as well as to the smaller, warmer distributaries. During dry and normal years, the coldwater reserves are used up in the summer or fall, and the temperature of water released from the dam

consistently exceeds 68 ^{0}F from July through October, resulting in mortality and reproductive failure of the coldwater fish population. Recruitment from the lake or upper river is generally considered minimal except during times of very high releases. As a result, the rainbow trout fishery depends on repeated stocking with hatchery fish, which take 1 year or more to reach reproductive maturity and which experience relatively low survival and spawning success.

The most abundant species in the lower Kings River from the dam downstream to Highway 180 is the Sacramento sucker, with fewer numbers of native species of sculpin, Sacramento squawfish, hitch, hardhead, stickleback, rainbow trout, and California roach. Introduced species include golden shiners, various sunfish species, and several catfish species. Downstream of Highway 180 to Reedley, the fish community includes both species typical of cooler waters such as trout, smallmouth bass, and spotted bass, and species associated with warmer waters like Sacramento sucker, green sunfish, carp, and catfish. Only warmwater species such as largemouth bass, bluegill, green sunfish, and catfish are found below Reedley.

Fishery Habitat. As part of an instream flow study, the lower Kings River was habitat-typed by Trihey and Associates (1992), at a flow of 250 cfs. The river between the dam and Fresno Weir consists of about 64 percent runs, 14 percent riffles, and 22 percent pools at a flow of 250 cfs, and would show an increasing proportion of run habitat at higher flows. The channel substrate throughout the area is generally much larger than the recommended size for coldwater fish spawning due to the lack of gravel recruitment and the high irrigation and periodic flood release flows. A few patches of smaller gravels are present near river miles 9 and 10, and in very limited amounts in side channels downstream of the Avocado Split (river mile 7). In-water cover is extremely limited in the main channel except for boulder projects near Winton, Avocado Lake, and County park land (KRCD, 1994). Depth complexity is also severely limited although deep holes are present upstream of Avocado Lake, in association with riffles at Choinumni Park and upstream of Piedra, as well as downstream of the Piedra Bridge (FWS, 1996).

The importance of streamside vegetation as cover would be expected to vary with streamflow, providing some instream and overhead cover at bankfull conditions and above (generally at least 250 cfs), and virtually none at the lowest flows (50 cfs). Riparian and SRA vegetation varies somewhat, but is generally considered moderate through the first 10 miles, with typical species such as cottonwoods, willows, and sycamores. Past bank protection and channel stabilization projects have created mostly a single defined channel. One section of river channel near Gravesboro exhibits side channels as well as a much better riparian canopy. Upstream of this area, aerial photographs show several discrete 600- to 800-foot lengths of bank which lack woody vegetation of any kind, possibly due to rock bank stabilization, vegetation clearing, and/or cattle grazing.

The KRCD monitors water temperature at the Fresno Weir and several other monitoring sites. Table 3-2 shows the number of days under existing conditions that are stressful or lethal for rainbow trout (indicative of coldwater fishery) in the Kings River downstream of Pine Flat Dam. Stressful temperatures are defined as 69.8 ^{0}F or higher, and lethal temperatures are 77 ^{0}F or higher.

Table 3-2. Baseline Temperature Conditions (Number of Days) for Rainbow Trout in the Kings River Downstream of Pine Flat Dam in Various Water-Year Types[1]

CRITICALLY DRY YEAR (1992)										
Condition[2]	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Stressful	0	0	0	0	9	31	30	27	0	97
Lethal	0	0	0	0	0	29	0	0	0	29
DRY YEAR (1988)[3]										
Stressful	0	0	3	0	8	31	25	26	X	93
Lethal	0	0	0	0	0	7	10	X	X	17
NORMAL YEAR (1994)										
Stressful	0	0	0	0	1	21	30	12	0	64
Lethal	0	0	0	0	0	0	6	1	0	7
WET YEAR (1996)[4]										
Stressful	0	0	0	0	0	0	0	7	0	7
Lethal	0	0	0	0	0	0	0	0	0	0

[1]Data are from KRCD's Ryan TempMentor temperature monitor near Fresno Weir. Occasionally, data are produced by regression analysis from other temperature monitoring sites. The daily SNTEMP model is used to compare actual baseline conditions to temperature conditions with dam and flow modifications.

[2]Stressful ' 69.8 ^{0}F or higher. Lethal ' ^{0}77 F or higher. The values are from Hokanson, K.F.F., C.F. Kleiner, and T.W. Thorslund. 1977. Effects of Constant Temperatures and Diel Temperature Fluctuations on Specific Growth and Mortality Rates and Yield of Juvenile Rainbow Trout, *Salmo gairdneri*, J. Fish Res. Board Can. 34, 639-648; and Raleigh, R.F., T. Hickman, R.C. Solomon, and P.C. Nelson. 1984. Habitat Suitability Information; Rainbow Trout. U.S. Fish and Wildlife Service, FWS/OBS-82/10.60, respectively.

[3]Data were unavailable for November. Only the first 3 days of October were available at Fresno Weir. The remaining 23 days of stressful temperature were taken from the sensor at the Corps bridge. Lethal temperatures for October were not available after October 3, 1988.

[4]A cooperative effort between KRWA, DFG, and KRCD allowed additional water releases to reduce the effect of an October hot spell. Due to warmer weather, the potential for lethal water temperatures was increased, but the water releases were able to minimize the effect.

Byrd Slough Habitat Restoration Site

There are two main water sources at this site. The primary source is the Kings River on the west, and the secondary source is Byrd Slough, which crosses the site. There are no permanent fishery resources on this site. Byrd Slough currently provides minimal fishery value since there is generally sufficient water to sustain a fishery in the slough only during the irrigation season.

Occasionally, floodflows pond on site and create seasonal wetlands. Floodwaters entering the site carry fish from the Kings River. However, fish cannot survive long term outside the river.

3.3.3 Special Status Species

Regulatory Background

The Federal Endangered Species Act of 1973 (FESA) (50 CFR 17) provides legal protection and requires definition of critical habitat and development of recovery plans for plant and animal species in danger of extinction. In addition, the FESA requires Federal agencies to make a finding on all Federal actions that might jeopardize the continued existence of any listed species or any species officially proposed to be listed under the FESA. The State has a parallel mandate embodied in the California Endangered Species Act of 1977 (CESA). The plant and animal species protected under FESA and CESA are listed as endangered, threatened, or, in the case of plants, rare.

In addition to formal lists of endangered and threatened species, the Federal and State Governments also maintain lists of species of special concern based on factors such as limited distribution, declining population size, diminishing habitat acreage or value, or unusual scientific, recreational, or educational value. Species of special concern are not afforded the same legal protection as listed species, but may be added to official lists in the future. The two general categories of special interest species include species that are candidates for listing as threatened or endangered and species that are not candidates for listing, but have been unofficially identified as species of special interest by private conservation organizations or local government agencies.

Before any Federal agency can undertake an action involving modification of the environment, FESA requires that a finding be reached by the FWS concerning the potential of that action to jeopardize the continued existence of any listed species. Unless they are also listed under FESA, species listed by the State are not protected under the Federal act. Under CESA, however, the DFG is empowered to review projects for potential effects to State-listed species and their habitats.

Potentially Affected Species

Special status species with the potential to occur in the study area were derived from the following sources:

- Species listed, proposed for listing as threatened or endangered, candidate species, and species of concern under the FESA as identified in two letters from FWS dated August 4, 1997, and updated January 31, 2001 (Appendix B);

- Species listed or proposed for listing by the State as threatened or endangered under the CESA;

- A search of the DFG's Natural Diversity Database (1997);

- A review of other environmental documents prepared for sites in the study area; and

- A review of literature on species distribution and habitat requirements.

The resulting list of Federally and State-listed, proposed, candidate, and species of special concern is presented in the Biological Data Report (BDR), which is included in Appendix C. The BDR discusses in detail the habitat, distribution, and occurrences of all of these species. The BDR also presents information on potential project effects and general threats to a species' survival. Table 3-3 includes the Federally and State-listed, proposed, and candidate species. The table summarizes the documented occurrences of these species in the project area, as well as information on habitat requirements and distribution.

Surveys for several species (noted below by "surveys") would be conducted prior to construction to verify and document their occurrence at the restoration site. If necessary, the Corps would then request formal consultation with the FWS under Section 7 of the FESA and with DFG under the CESA to coordinate efforts to avoid or reduce any adverse effects to less than significant.

Based on a review of the habitat requirements and study area occurrences of the species that could occur in the study area, the species which may be affected by the alternatives are the Federally listed endangered Hartweg's golden sunburst (surveys) and California jewelflower; Federally listed threatened California red-legged frog, bald eagle, valley elderberry longhorn beetle, San Joaquin kit fox, and San Joaquin adobe sunburst; Federally listed proposed threatened tree-anemone; State-listed endangered little willow flycatcher; and State-listed threatened Swainsons hawk (FWS, 1998).

Potential effects to these species are discussed in Section 4.3. The other species are not evaluated further because (1) they are not likely to occur in the study area due to lack of suitable habitat, (2) there are no known occurrences near the study area, and/or (3) existing habitat is far enough from the work sites that the habitat or species would not be disturbed during construction.

Table 3-3. Special Status Species with Potential to Occur in the Project Area

Species	Status Fed/State/CNPS	Habitat Requirements	Distribution	Occurrence in the Project Area
Fish				
Sacramento splittail *Pogonichthys macrolepidotus*	T/T	Aquatic habitat in creeks, streams, and rivers; spawns over shoreline vegetation or gravel	San Francisco Bay/Delta region and lower Sacramento and San Joaquin Rivers	No Natural Diversity Database (NDDB) records; does not occur within the geographic area of the project
Delta smelt *Hypomesus transpacificus*	T/T	Estuarine areas with salinities below 2 grams per liter; spawns in freshwater	Delta estuary from Suisun Bay upstream to the Delta cross channel on the Sacramento River and south along the San Joaquin and Middle River to the south end of Bacon Island	No NDDB records; does not occur within the geographic area of the project
Amphibians				
California red-legged frog *Rana aurora draytonii*	T/SSC	Permanent and semipermanent aquatic habitats, such as creeks and coldwater ponds, with emergent and submergent vegetation and riparian species along the edges; may estivate in rodent burrows or cracks during dry periods; may be found far from water	Coast and coastal mountain ranges of California from Humboldt County to San Diego County; Sierra Nevada	No NDDB records; potential habitat exists in the restoration area, although they are usually found in higher elevations in the Sierra Nevada and not usually along major rivers where predatory fish occur; presumed present at the restoration area until surveys can be completed
Reptiles				
Blunt-nosed leopard lizard *Gambelia (Crotaphytus) silus*	E/E	Open habitats with scattered low bushes on alkali flats, and low foothills, canyon floors, plains, washes, and arroyos; substrates may range from sandy or gravelly soils to hardpan	San Joaquin Valley from Stanislaus County through Kern County; along the eastern edges of San Luis Obispo and San Benito Counties	Recorded east of Mendota, and along White Bridge Road; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species

Species	Status F/S/CNPS	Habitat Requirements	Distribution	[illegible]
Birds				
Aleutian Canada goose *Branta canadensis leucopareia*	T/--	Roosts in large marshes, flooded fields, stock ponds, and reservoirs; forages in pastures, meadows, and harvested grainfields; corn is especially preferred	The majority of the population winters in Butte Sink, then moves to Los Banos, Modesto, the Delta, and east Bay reservoirs; stages near Crescent City during spring before migrating to breeding grounds	No NDDB records; project area is outside it's migration route/wintering range
California condor *Gymnogyps californianus*	E/E	Requires large blocks of open savanna, grasslands, and foothill chaparal with large trees, cliffs, and snags for roosting and nesting	Historically, rugged mountain ranges surrounding the southern San Joaquin Valley; currently, most individuals are captive populations, but a few birds were recently released in the rugged portions of the Los Padres National Forest	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Bald eagle *Haliaeetus leucocephalus*	T/E	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, river, creek (nesting and roosting), stream, or ocean	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced to the central coast; winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierras, and east of the Sierra Nevada south of Mono County; range expanding	Nearest breeding record is at Eastman Lake, Madera County; may have a few wintering populations at Pine Flat Lake and just downstream of Pine Flat Dam; presumed present at Pine Flat Lake in the winter
American peregrine falcon *Falco peregrinus anatum*	E/E	Nests and roots on protected ledges of high cliffs, usually adjacent to marshes, lakes, or rivers that support plentiful bird populations	Permanent resident on the north and south Coast Ranges; may summer on the Cascade and Klamath Ranges, south through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Pennisular Ranges and the plains east of the Cascade Range	No NDDB records; nesting has been reported approximately 25 miles upstream of Pine Flat Dam; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species

Species	Status Fed/State	Habitat Requirements	Distribution	Occurrence in the Project Area
Little willow flycatcher *Empidonax traillii brewsteri*	SC/E	Riparian woodlands along streams and rivers, in broader canyons and flood plains, and around mountain meadows, mountain springs, and seepages with dense willow stands 3 to 8 feet high (breeding)	Most remaining populations nest in the Sierra Nevada and Cascades; summer range includes a narrow strip along the eastern Sierra Nevada from Shasta County to Kern County, another strip along the western Sierra Nevada from El Dorado County to Madera County; widespread in migration	Reported nesting near Shaver Lake, about 14 miles north of the restoration area; marginal-quality nesting habitat is present at the restoration area; may occur in the restoration area during migration; presumed present in the restoration area during migration
Swainson's hawk *Buteo swainsonii*	--/T	Cottonwoods or oaks near riparian habitats (nesting); grasslands, irrigated pastures, and grain fields (foraging)	Lower Sacramento and San Joaquin Valleys, Klamath Basin, and Butte Valley	No NDDB records; there is suitable nesting and foraging habitat at the restoration area; presumed present at the restoration area during migration
Mammals				
San Joaquin (Nelson's) antelope ground squirrel *Ammospermophilus nelsoni*	SC/T	Arid grassland at elevations from 200 to 1,200 feet with loamy soils and moderate shrub cover of atriplex and other shrub species	Western side of the San Joaquin Valley from southern Merced county south to Kern and Tulare Counties; also found on the Carrizo Plain in San Luis Obispo County and the Cuyama Valley in San Luis Obispo and Santa Barbara Counties	Recorded approximately 4 miles north of the rural west side of Fresno; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Fresno kangaroo rat *Dipodomys nitratoides exilis*	E/E	Found at elevations from 200 to 300 feet in alkali sink habitats	Found only in Fresno County	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Tipton kangaroo rat *Dipodomys nitratoides nitratoides*	E/E	Found at elevations from 200 to 300 feet in arid grassland and alkali desert scrub communities with sparsely scattered shrubs; soil is usually finely textured and alkaline; may use areas that flood in winter and spring	Occurs in the Tulare Lake Basin in portions of Fresno, Tulare, and Kern Counties	No NDDB records; does not occur within the geographic area of the project, and no suitable habitat is present to support the species

Species	Status Fed/State	Habitat Requirements	Distribution	Occurrence in Project Area
Giant kangaroo rat *Dipodomys ingens*	E/E	Restricted to flat sparsely vegetated areas with native annual grassland and shrubland habitats; requires uncultivated soils consisting of dry, fine, sandy loams for burrowing	Occurs at high densities in only 12 square miles along the western side of the San Joaquin Valley in five separate localities on Elkhorn Plain, Carrizo Plain, McKittrick Valley, and Cuyama Valley in Kern and San Luis Obispo Counties	No NDDB records; does not occur within the geographic area of the project and no suitable habitat is present to support the species
San Joaquin kit fox *Vulpes macrotis mutica*	E/T	Saltbush scrub, grassland, oak savanna, and freshwater scrub	Principally occurs in the San Joaquin Valley and adjacent open foothills to the west; recent records from 17 counties extending from Kern County north to Contra Costa County	Recorded near Jameson, occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Sierra Nevada red fox *Vulpes vulpes necator*	SC/T	Red fir and lodgepole pine forests, generally from 5,000 to 8,400 feet, associated with mountain meadows	Cascade Range east to the Sierra Nevada, then south to Tulare County	No records; suitable habitat is not present in the project area to support this species
California bighorn sheep *Ovis canadensis californiana*	SC/T	Dwarf shrub, sagebursh, desert scrub, pinyon juniper, and montane riparian habitat	Southern Sierra Nevada at Mount Baxter and Mount Williamson	No records; suitable habitat is not present in the project area to support this species
California wolverine *Gulo gulo luteus*	SC/T	Sighted in a variety of habitats from 1,600 to 14,200 feet; most common in open terrain above timberline and subalpine forests	Klamath and Cascade Ranges, south through the Sierra Nevada to Tulare County	No records; suitable habitat is not present in the project area to support this species
Invertebrates				
Vernal pool fairy shrimp *Branchinecta lynchi*	T/--	Common in vernal pools; also found in sandstone rock outcrop pools	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County; isolated populations also in Riverside County	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Vernal pool tadpole shrimp Lepidurus packardi	E/--	Vernal pools and ephemeral stock ponds	Shasta County south to Merced County	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species

Species	Status Fed/State/CNPS	Habitat Requirements	Distribution	Occurrence in Project Area
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs in moist valley riparian and oak woodland habitats along the margins of streams and rivers	Northern San Joaquin and southern Sacramento Valleys; streamside habitats below 3,000 feet through the Central Valley of California	No records; elderberry shrubs present at the restoration site; presumed present in the elderberry bushes at the restoration site
Plants				
San Joaquin woolly threads *Lembertia congdonii*	E/–/1B	Alkaline and loamy plains in chenopod scrub, sandy valley, and foothill grassland at 300 to 2,300 feet above sea level	Fresno, Kern, Santa Barbara, San Benito, and San Luis Obisbo Counties; eliminated from Kings and Tulare Counties	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Hoover's eriastrum *Eriastrum hooveri*	T/–/4	Chenopod scrub, valley and foothill grassland habitat; on mound tops in sparsely vegetated alkaline alluvium fans on sandy soils	Fresno, Kings, Kern, Santa Barbara, San Benito, San Luis Obisbo, and Tulare Counties	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Palmate-bracted bird's-beak *Cordylanthus palmatus*	E/E/1B	Alkaline flats in chenopod scrub and valley and foothill grassland below 200 feet	Alameda, Colusa, Fresno, and Yolo Counties; eliminated from Madera and San Joaquin Counties	No NDDB records; occurrence highly unlikely due to lack of suitable habitat in the project area to support the species
Hartweg's golden sunburst *Pseudobahia bahiifolia*	E/E/1B	Valley and foothill grassland that is interspersed with vernal pools; around 500 feet elevation	Fresno, Madera, and Stanislaus Counties; eliminated from Sutter and Yuba Counties	No records; occurrence highly unlikely due to lack of well developed habitat or alluvial fan or vernal pool habitat at the restoration site; presumed present until surveys can be completed in spring
California jewelflower *Caulanthus californicus*	E/E/1B	Non-alkaline grassland, chenopod scrub, open pinyon-juniper woodland, valley and foothill grassland; on flats and gentle slopes between 210 feet and 3,300 feet elevation	Fresno, Kern, Santa Barbara, and San Luis Obisbo Counties; eliminated from Kings and Tulare Counties	No records; suitable habitat occurs at the restoration site; presumed present at the restoration site until surveys can be completed in the spring

Species	Status	Habitat Requirements	Distribution	Occurrence in Project Area
Keck's checkerbloom *Sidalcea keckii*	PE/-/1B	Grassy serpentine slopes in oak woodland and valley and foothill grassland at approximately 1,300 feet elevation	Tulare County	No records; occurrence highly unlikely because of the lack of serpentine substrates at the restoration site and the plant's doubtful occurrence in Fresno County
Mariposa pussypaws *Calyptridium pulchellum*	PE/-/1B	Sandy soils and decomposed granite in oak woodland between 1,300 and 3,600 feet elevation	Fresno, Madera, and Mariposa Counties	No records; occurrence highly unlikely because of the lack of suitable habitat at the restoration site and the different elevation range
Tree-anemone *Carpenteria californica*	PT/T/1B	On streambanks and granite substrates in chaparral and oak woodland between 1,500 and 3,300 feet elevation	Fresno County	No records; suitable habitat occurs at the restoration site; presumed present at the restoration site until surveys can be completed
San Joaquin adobe sunburst *Pseudobahia peirsonii*	T/E/1B	Bare, dark clay soils in valley and foothill grassland and oak woodland between 330 and 2,600 feet elevation	Fresno, Kern, and Tulare Counties	No records; suitable habitat occurs at the restoration site; presumed present at the restoration site until surveys can be completed
San Benito evening-primrose *Camissonia benitensis*	T/-/1B	Clay or gravelly serpentine alluvial terraces in chaparral and oak woodland at approximately 2,000 feet elevation	Fresno and San Benito Counties	No records; occurrence highly unlikely because of the lack of suitable habitat at the restoration site
Fleshy owl's clover *Castilleja campestris ssp. succulenta*	T/E/1B	Vernal pools and other moist places in annual grassland below an elevation of 7,545 feet	Fresno, Madera, Merced, Mariposa, and Stanislaus Counties	No records; no well developed suitable habitat is present in the project area
San Joaquin orcutt grass *Orcuttia inaequalis*	T/E/1B	Well developed vernal pools in annual grassland below an elevation of 560 feet	Fresno, Madera, and Merced Counties; eliminated from Stanislaus and Tulare Counties	No records; no well developed suitable habitat is present in the project area

Species	Status[1] Fed/ST/CNPS[2]	Habitat Requirements	Distribution	Occurrence in Project Area
Greene's tuctoria *Tuctoria greenei*	E/R/1B	Well developed vernal pools in annual grassland below an elevation of 560 feet	Butte, Merced, Shasta, and Tehama Counties; eliminated from Fresno, Madera, San Joaquin, and Tulare Counties	No records; no well developed suitable habitat is present in the project area

[1]Key to Status:
Federal:
E = Endangered
T = Threatened
PE = Proposed Endangered
PT = Proposed Threatened
C = Candidate: taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened
SC = Species of Concern (formerly category 2 Candidate): taxa for which existing information may warrant listing, but for which substantial biological information to support a proposed rule is lacking

State:
E = Endangered
T = Threatened
R = Rare
CSC = California Species of Concern

CNPS:
1B = Rare or Endangered in California and elsewhere
[2]California Native Plant Society designation applies only to plants.

-- = No Listing

3.3.4 Water Quality

Regulatory Background

Federal Clean Water Act (P.L. 95-217). The Clean Water Act (CWA) was initially passed in 1976. The act sets forth a national strategy for protection of water quality. The act sets primary and secondary standards for water quality based on existing baseline conditions. These standards set threshold levels for various compounds which are known to have adverse effects on human health. The standards also identify compounds which are known to be carcinogenic or mutagenic. At a minimum, all potable water supplies must meet the primary standards set by the CWA.

The CWA also regulates the practice of discharging materials into waters of the United States. This regulation is primarily accomplished through the issuance of National Pollutants Discharge Elimination System permits. This permitting responsibility has been delegated to the State of California. Discharges require permits from the U.S. EPA and/or the affected state. Section 404 of the act establishes the guidelines for filling and dredging in waterways. If a project proposes to fill or dredge waters of the U.S., a Section 404(b)(1) analysis must be prepared to disclose the potential effect of such an action on the water quality of that water body. The CWA also requires all applicants for a Federal license or permit to obtain state certification for water quality conformance.

Porter-Cologne Water Quality Act. The California Water Quality Control Act was passed in 1969. The act sets a State-wide water quality policy. To coordinate and carry out the provisions of the Act, the Legislature established the State Water Resources Control Board and nine California regional water quality boards. These regional boards establish water quality objectives for their respective regions. These objectives embrace those of the Federal CWA as well as additional objectives set forth by the Porter-Cologne Water Control Act. The objectives are divided into those for inland surface water and those for ground waters. The specific water quality plan for the study area is for the Tulare Basin.

Water Quality Control Plan for the Tulare Basin. The principle purpose of the plan is to set water quality objectives for the basin. The objectives are subdivided into water quality objectives for inland surfaces waters and ground waters. The plan also describes the methodology for implementation of the objectives and the surveillance and monitoring procedures to ensure that the objectives are achieved. The regional water quality control boards are mandated to periodically prepare water quality assessments. These assessments are designed to provide a catalog of California water bodies and their water quality condition. Water bodies are rated as good, intermediate, impaired, or unknown.

Existing Conditions

Pine Flat Reservoir. In general, the water quality of the Pine Flat Lake is good. However, the lake is sensitive to contamination because it flushes relatively slowly. Types of possible contaminants include suspended sediments, heavy metals, and excessive nitrogen and phosphorus. In addition, low water levels can result in reduced dissolved oxygen, increased algae growth, and higher temperatures.

Water temperature levels at Pine Flat Lake have a seasonal fluctuation. The lake usually becomes thermally stratified during March through September, when the days are hot and long. As most lakes of its size, Pine Flat Lake stratifies into three layers, with the cooler, heavier layer on the bottom and the warmer layers near the surface. The top 30 feet of the lake are well mixed and warm in the summer months. This warm, upper layer of water overlies a 10- to 20-foot-thick layer where temperature changes rapidly. All the water below this layer is cold, with a secondary layer that is severely cold.

To avoid adverse trends in water quality, the Corps regularly monitors the physical, chemical, and biological conditions in the lake. The monitoring program consists of water surface and air temperature monitoring near the dam, successive water temperature monitoring at one inflow and one outflow location, and laboratory analysis of various components from three inflow, two lake, and three outflow samples on an irregular basis. In addition, multiple dissolved oxygen and temperature profiles, and two electrical conductivity and pH profiles are taken in the deepest portion of the lake.

These water quality data are collected biannually from the lake during the spring and summer (April and August). This is after the major winter inflows have occurred and after strong thermal stratification has developed in the summer. Collecting water quality data during these times of the year allows for an accurate analysis for potential human health and aquatic life problems.

Reservoir sedimentation studies are taken periodically to determine the quality, extent, and location of sedimentation deposits in the reservoir from the bed load and suspended load entering the reservoir from the Kings River. Quantities of sediments are obtained by monitoring a system of permanent ranges across the reservoir. Sedimentation concentration samples of outflow are also taken to determine the annual volume of sediment passing through the dam. Increased suspended sediment in the lake water increases turbidity and lowers light penetration (California Regional Water Quality Control Board, 1995). Sediment also carries pollutants such as pesticides, heavy metals, and nutrients.

The amount of dissolved oxygen in the lake is generally high because of the considerable depth and low temperatures of the lake. In addition, the upper reaches of the lake also receive a highly aerated inflow from the Kings River. For

example, in 1997 the lake had a dissolved oxygen reading of 10 milligrams per liter (mg/l) in April and 11.3 mg/l in August (Corps, 1997a). Dissolved oxygen levels are lowest in the summer when the lake temperatures are the highest. This is a direct result of the lake level falling and the algae mass increasing. The lowest content in the reservoir was 5.4 mg/l in 1997, measured at the bottom of the lake (Corps, 1997).

To meet the Federal and State drinking water standards, Pine Flat Lake is analyzed for dissolved arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium, and zinc, and for total boron, calcium, iron, magnesium, manganese, potassium, and sodium. The chemical quality of water in Pine Flat Lake is calcium bicarbonate in character. It is soft to moderately hard, highly acceptable for irrigation, and meets chemical standards for drinking water. Based on 1997 monitoring data, manganese and iron appear to be the two contaminants of concern for Pine Flat Lake. However, the high levels of manganese and iron are typically found in reservoirs because the solubility of manganese and iron is related to the lack of dissolved oxygen from decomposing organic matter. Since the high levels of manganese and iron are likely a natural condition, this requires no corrective action except for continuous monitoring in the future. All other water quality criteria fall within acceptable State and Federal maximum contaminant levels.

Low water levels adversely affect water quality by raising water temperatures, concentrating pollutants, lowering dissolved oxygen, and decreasing the natural flushing of the system. One concern is the amount of algae located in the lake. Algae mass is produced from high nitrogen and phosphorus concentrations in the lake. The amount of algae in the lake determines whether these nitrogen and phosphorus concentrations are becoming excessive. Too high a concentration of nutrients can result in eutrophication, causing bad taste and odor problems.

Lower Kings River. Water quality is good in the reach of the lower Kings River and its distributaries from Pine Flat Dam to Highway 180. These waters are of good quality, and their main use is for irrigation of agricultural crops.

Water quality in the river is affected primarily by low flows and warm water temperatures. Several long-term water quality problems facing the Kings River below Highway 180 are increases in salinity, increases in temperature, surface runoff, and erosion. Human activities have accelerated these problems through intensive use of soil and water resources. Degradation of water quality is generally related to the intensity of activities, and the volume, quality, and uses of the receiving waters.

Temperature plays an essential role in the survival of coldwater fisheries in the lower King's river. Instream temperatures are affected by the temperature of dam releases, weather, and flow rates (Corps, 1994b). In late summer and

early fall when water temperatures are high, low flows result in the highest instream temperatures. These high temperatures below the dam in August, September, and October are considered to be a limiting factor for the coldwater fish populations. In addition, abrupt changes in water temperature can lead to the mortality of coldwater fish.

Byrd Slough Habitat Restoration Site. Water quality is good in the reach of the lower Kings River and its distributaries from Pine Flat Dam to Highway 180. Two of these distributaries are the Alta Main Canal and Byrd Slough. Water in the Alta Main Canal, which runs along the east side of the restoration site, is diverted from the river about 4 miles upstream. Water in Byrd Slough, which runs through the site, is diverted from the Alta Main Canal. These waters are of good quality, and their main use is for irrigation of agricultural crops. Water quality in the river is affected primarily by low flows and warm water temperatures. The Alta Main Canal and Byrd Slough flow mainly during the irrigation season.

3.3.5 Air Quality

Climate

The climate of the lower basin is characterized by hot, dry summers and moderate winters with temperatures that vary considerably. Summer highs exceed 100 ^{0}F on occasion, while winter lows may drop below freezing. Temperatures in the mountains generally decrease with increasing elevation. At the higher elevations, the summers are cool, and the winters are severe.

Observed temperature extremes in the basin range from 114 ^{0}F to 18 ^{0}F in Fresno and 89 ^{0}F to -18 ^{0}F at Huntington Lake (elevation 7,020 feet). The average annual precipitation varies greatly throughout the region. It ranges from about 6 inches on the valley floor to about 60 inches in the mountains. The average in Fresno is about 10.5 inches.

About 90 percent of the runoff-producing precipitation falls from November through April. Precipitation occurs as rain at elevations below 5,000 feet and usually as snow at higher elevations. A snowpack normally accumulates in the mountains during the winter and reaches its peak in depth and water content in late March and early April, when temperatures are warm enough to begin melting the snow. By the end of July, about 95 percent of the average annual runoff has occurred.

Regulatory Background

Federal Clean Air Act. The Federal Clean Air Act enacted in 1969 established the National Ambient Air Quality Standards. These standards include both primary and secondary standards for various air pollutants. The

primary standards define maximum concentrations of specific pollutants which are set to protect the public health. The secondary standards define maximum concentrations of certain pollutants which are known or suspected of causing plant damage, visibility impairment, or material soiling.

The Federal Clean Air Act also delegates primary enforcement to the states. In California, the Air Resources Board has been designated as the responsible agency for all air quality regulation. The State must promulgate rules and regulations which promote the goals of the Federal Clean Air Act and assist in their attainment. The State may promulgate rules and regulations which are at least as stringent as the mandated Federal requirements. In states where one or more of the criteria pollutants exceed the National Ambient Air Quality Standards, the state is required to prepare a State Implementation Plan which defines how the state intends to meet these standards in a timely manner as detailed in the Federal Clean Air Act. The Air Resources Board has in turn delegated responsibility to the local air quality management district or air pollution control district.

In 1990, the Federal Clean Air Act was amended. New criteria were established for nonattainment classifications, emission control requirements, and compliance dates for geographic areas which are in nonattainment for one or more pollutants. In addition, the amended act requires that any Federally funded project must comply with the air quality standards and regulations that have been established by State Implementation Plans.

The U.S. EPA developed the General Conformity Rule, which became effective on January 31, 1994, to implement section 176c of the Federal Clean Air Act. The underlying principle of the General Conformity Rule is that Federal actions must not cause or contribute to any violation of a National Ambient Air Quality Standard. A conformity determination is required for each pollutant where the total of direct and indirect emissions caused by a Federal action in a nonattainment area exceeds *de minimis* threshold levels listed in the General Conformity Rule (40 CFR 93.153).

California Clean Air Act. The California Clean Air Act was passed in 1988. The act established the Air Resources Board to regulate mobile air pollution sources and to oversee the functions of the local air pollution control districts. The Air Resources Board established the California Ambient Air Quality Standards. These State standards are more stringent than the Federal standards and include pollutants which are not addressed by the Federal standards. In addition, the Air Resources Board is responsible for preparing and updating the State Implementation Plan. In turn, each air district prepares an Air Quality Attainment Plan to demonstrate how it will achieve the California standards. Each district prepares rate of progress plans and attainment plans for criteria pollutants for which it is in Federal nonattainment. These plans are

submitted to the Air Resources Board for inclusion in the State Implementation Plan.

Achievement of conformity is also intended to protect the integrity of the State Implementation Plan by helping to ensure that growth projections are not exceeded, emission reduction targets are achieved, and air quality attainment and maintenance efforts are not undermined.

Air Quality Planning and Control in Fresno County. The California Air Resources Board has divided California into regional air basins according to topographic air drainage features. Fresno County is part of the San Joaquin Valley Air Basin (SJVAB), which is composed of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and western and central Kern Counties. The SJVAB is the second largest air basin in the State.

The SJVAB is defined by the Sierra Nevada on the east, the Coast Ranges on the west, and the Tehachapi Mountains on the south. Although marine air generally flows into the basin from the San Joaquin River Delta, the region's topographic features restrict air movement through and out of the basin. This results in weak air flow which becomes blocked vertically by high barometric pressure over the valley. As a result, the SJVAB is highly susceptible to pollutant accumulation over time.

The pollutants which are monitored in Fresno County include ozone, carbon monoxide (CO), particulate matter 10 microns in size (PM_{10}), and others. Ozone is a bluish or colorless gas that is formed in the atmosphere by complex photochemical reactions between nitrogen oxides (NO_x) and reactive organic gases (ROG) in the presence of sunlight. These two are referred to as ozone precursors and are the result of the combustion process (for example, automobile engines and some industrial processes).

National Ambient Air Quality Standards and California Ambient Air Quality Standards have been set for several other pollutants including nitrogen dioxide, sulfur dioxide, lead, hydrogen sulfide, sulfates, and visibility reducing particles. These pollutants are ozone precursors and/or respiratory irritants. In addition, lead can cause diminished mental capability.

Existing Conditions

Air pollution in the SJVAB can be attributed to human activities that cause emissions, coupled with natural phenomena that stimulate the formation of unhealthy air. The topography of the SJVAB is composed of foothills and mountain ranges to the east, west, and south, and the relatively flat valley floor. The San Joaquin Valley is surrounded by mountains on the west, east, and south. Additionally, the long, sunny summers and relatively short, foggy winters contribute to local climatic episodes such as frequent temperature inversions.

The human causes of air pollution in the valley are population growth, urbanization, mobile sources (cars and trucks), oil production, and agriculture. The most significant factors in accelerating the decline of air quality in the SJVAB are the valley's rapid population growth, and its associated increases in traffic urbanization and industrial activity. The decline in oil production since 1985 has resulted in decreased emissions in that industry.

Sensitive receptors are those individuals and/or wildlife who could be affected by changes in air quality due to emissions from the project. Sensitive receptors are often associated with facilities such as residences, schools, playgrounds and parks, and hospitals. Since there is little development in the study area, however, sensitive receptors include primarily visitors, recreationalists, residents, and wildlife. At the Pine Flat Dam site, the observation area and the fishing area immediately below that dam are used by visitors and recreationalists. However, the multilevel intake structure would be constructed in the fall, which is off-season for recreational activities at Pine Flat Dam. The restoration site is visited occasionally by recreationalists.

On the basis of Federal and State standards, Fresno County is currently designated as a serious nonattainment area (Federal) and a severe nonattainment area (State) for ozone. The county, except the Fresno urbanized area is designated as a Federal and State attainment area for CO, and the entire county is in attainment for Federal and State standards for nitrogen dioxide, sulfur dioxide, and lead. The SJVAB, including Fresno County, is designated as a serious nonattainment area (Federal) and a nonattainment area (State) for PM_{10}. The county is unclassified for hydrogen sulfide and sulfates.

To deal with violations of standards in the region, the San Joaquin Valley Unified Air Pollution Control District (SJAPCD) produced an Air Quality Attainment Plan in 1991. This plan was produced to address the California nonattainment status of ozone and PM_{10}.

3.3.6 Land Use/Prime and Unique Farmland

Regulatory Background

The continuing conversion of agricultural lands led to the passage of the Farmland Protection Act (Public Law 97-98). This act expressed the need for all Federal agencies to recognize the effect of their actions and programs on the nation's farmlands.

The U.S. Department of Agriculture (USDA) was charged with implementing a program to develop criteria for identifying the effects of Federal programs on the conversion of farmlands to nonagricultural uses. These criteria were published in 1983. The major requirements are that (1) Federal agencies

must use USDA criteria to identify and take into account the adverse effects to their programs on the preservation of farmland; and (2) Federal agencies must consider alternative options, as appropriate, to reduce such adverse effects and ensure that their programs, to the extent practicable, are compatible with State, local, and private programs. The act also authorizes local governments to identify farmland of local importance and exempts land already committed to urban development. It does not include publicly owned lands for which there is an adopted policy to prevent agricultural use.

The Natural Resources Conservation Service (NRCS) developed several categories of important farmlands, as modified for California. These categories are based on the quality of the physical and chemical characteristics of the soil for the production of crops, and extent of agricultural use. The designated category is independent of the current use of the land. From highest to least quality, these categories include "Prime Farmland," "Farmland of Statewide Importance," "Unique Farmland," and "Farmlands of Local Importance."

Regional

The primary non-urban land uses in Fresno County are agriculture, cattle grazing, and recreation. The dominant land use in Fresno County is agriculture. During the late spring and summer irrigation season, almost the entire flow released from Pine Flat Dam is diverted and used for irrigation. Most of the Kings River service area was fully developed prior to the construction of many of the dams on the four rivers tributary to Tulare Lake, but some agriculture in the lower basin was expanded after the construction of Pine Flat Dam, due primarily to better regulation of the available water and reduced flood threat.

Fresno County has the largest harvested land area in California, and the general plan for Fresno County supports continued agricultural uses. Cattle grazing is another major land use. Urban development is concentrated in Fresno and small towns throughout the county. As cities and towns continue to grow, they may encroach into the agricultural lands. Community plans encourage a concentration of development, which will both enable services to be provided to residents and preserve agricultural lands.

Recreation is also a primary land use in Fresno County. The Pine Flat Lake and the lower Kings River are primarily used for swimming, fishing, and picnicking. The Kings River upstream from the dam, above elevation 995 feet, is designated as a special management area under the U.S. Forest System Act. The special management area is primarily for recreational use, but is also used for the preservation of fish and wildlife resources, and natural, scenic, and archeological values. The river reach upstream, above elevation 1,590 feet, is designated as wild and scenic under the Wild and Scenic Rivers Act.

Existing Conditions

Pine Flat Reservoir. The designated land uses around the reservoir include agriculture (grazing) residential, commercial, and public facilities (parks and recreation). The December 8, 1999, letter from the NRCS indicates that the Pine Flat Reservoir project area does not contain prime, unique, statewide, or local important farmland (Appendix D).

Lower Kings River. The designated land uses along the lower Kings River include floodway, open space, agriculture (grazing, vineyards, tree and row crops), residential, commercial, and public facilities. The December 8, 1999, letter from the NRCS indicates that the lower Kings River project area does not contain prime, unique, statewide, or local important farmland.

Byrd Slough Habitat Restoration Site. The designated land uses at the restoration site include floodway and open space. The December 8, 1999, letter from the NRCS indicates that the Byrd Slough restoration site does not contain prime, unique, statewide, or local important farmland.

3.3.7 Cultural Resources

Historic Conditions

Cultural resources or historic properties include buildings, structures, objects, sites, districts, and archeological resources with historic or prehistoric human activity, which are listed in, or eligible for, listing in, the National Register of Historic Places. Such properties may be significant for their historic, architectural, scientific, or other cultural values and may be of national, state, or local significance.

Although it is generally accepted that the San Joaquin Valley was inhabited 10,000 to 12,000 years ago, prehistory of the region is still not understood completely due to a lack of data. Some archeological work was done behind Pine Flat Dam before the reservoir was filled, but none associated with the habitat restoration area. Occupation of the region in general can be established 2,000 years prior to the present.

The Choinumni Yokuts made the area around what is now Pine Flat Dam and Lake their home for centuries before Spanish explorers visited the San Joaquin Valley in the 1700's. The remaining area downstream along the Kings River was occupied by other Yokuts. Mono peoples inhabited villages and other locations in the foothills along Sycamore, Mill, Big, Balch, and other streams.

Although Anglo-American explorers entered the Kings River area in the early to mid-1800's, it was not until the late 1800's when the land use truly

changed. At that point the waters of the Kings River were contained in ditches and canals, and the land was developed for agricultural use.

Existing Conditions

Pine Flat Reservoir. A cultural resources inventory of Pine Flat Dam and Lake was completed by archeologists affiliated with the University of California, Berkeley, prior to the construction of the dam in 1954. In 1984, archeologists with the University of California, Los Angeles reexamined known sites and surveyed all additional Pine Flat Lake park lands. While 33 prehistoric sites were recorded, none are located near Pine Flat Dam.

Byrd Slough Habitat Restoration Site. A records search by the Southern San Joaquin Valley Information Center was completed in 1993 for the Byrd Slough restoration area. No prehistoric or historic archeological sites were located within the area although three sites are located one-third mile to the east. A ground survey was conducted in March 1998 by Sacramento District archeologists. The house and barn that had been shown on the 1965 U.S. Geological Survey topographic map have been completely removed, and the ground has been totally disturbed. There were no indications of any other prehistoric or historic archeological remains.

CHAPTER 4.0

ENVIRONMENTAL CONSEQUENCES

4.1 VEGETATION AND WILDLIFE

This section evaluates the effects of the alternatives on vegetation and wildlife resources in the study area. Effects on vegetation and wildlife resources were analyzed with the FWS during coordination under the Federal Fish and Wildlife Coordination Act. As part of the coordination, a Habitat Evaluation Procedures (HEP) analysis was conducted to determine the effects on wildlife resources. This section summarizes the draft CAR and HEP analysis completed in November 1999. The draft CAR and HEP are included in Appendix A. The final CAR will be completed by December 2001 and will be provided as an addendum to the final EIS/EIR.

The significance of project effects to biological resources was evaluated based on Engineering Regulation 1105-2-100, which establishes significance criteria based on institutional recognition, public recognition, and technical recognition. In addition, significance thresholds were identified from the California Environmental Quality Act (CEQA) (California Office of Planning and Research, 1992) and local/regional plans and ordinances.

4.1.1 No Action

Under this alternative, the vegetative habitat types and associated wildlife species would remain basically the same in the study area. Foothill woodland, valley grassland, oak bottom, and riparian forest would remain the dominant native vegetative habitat types. Other habitats include open water and agriculture. Wildlife associated with these habitat types would continue to live in or pass through the area. However, riparian, SRA, and oak woodland habitat would continue to be degraded by cattle grazing at the Byrd Slough restoration site. This degradation of habitat would contribute to limitations of the number, abundance, and quality of fish and wildlife resources along the lower Kings River.

4.1.2 Multilevel Intake Structure

Construction of the multilevel intake structure would affect 2.07 acres of staging area that is an existing paved parking area at the south abutment of the dam. These effects would be temporary (about 24 months). The staging area would provide no habitat for special-status species. Other wildlife in the area may experience temporary disturbance and/or displacement due to construction noise and activity. However, they would be expected to return to the area when

construction is completed. The operation and maintenance of the multilevel intake structure would not adversely affect vegetation or wildlife.

4.1.3 Byrd Slough Habitat Restoration

Vegetation and wildlife would benefit as a result of riparian, SRA, and oak woodland habitat restoration at the Byrd Slough restoration site. Repairing the fencing, installing plantings at a density of 250 plants per acre, designing and constructing an irrigation system, installing wildlife structures, and maintaining the area for the life of the project would result in 72.42 average annual habitat units (AAHU's) according to the FWS HEP analysis.

Growth and survival of the plantings would be ensured through a 3-year establishment period (including monitoring) included as part of the alternative. No irrigation is anticipated beyond the 3-year establishment period. The groundwater table and sloping drainage should be sufficient to sustain the planted riparian species beyond the initial establishment period. At the end of the establishment period, the non-Federal sponsor would assume responsibility for long-term maintenance activities at the site.

Existing vegetation and wildlife may be temporarily disturbed during restoration activities. However, degraded annual grassland habitat (heavily grazed irrigation pasture) would regenerate, and seasonal wetlands, stream habitat, and mixed riparian forest would recover from grazing damage at the restoration site when the existing fence is repaired and the grazing is discontinued. Ecosystem restoration would increase wildlife populations that live in or pass through the area.

A staging area encompassing about 1 acre will be required for this alternative. The staging area will be located in an open grassland area within the restoration site, with little vegetation or wildlife use. Annual grasslands will be temporarily adversely affected at the staging area. The staging area would be reseeded with a native grass seed mix after construction is complete. The staging area is also at least 100 yards from any waterway, which is expected to have a less-than-significant effect to water quality.

4.1.4 Combined Restoration Plan

The combined restoration alternative would consist of a combination of the effects of the multilevel intake structure and Byrd Slough restoration site to vegetation and wildlife resources. Temporary, minor disturbances would occur during construction and restoration activities in the short term, but in the long term, overall ecosystem values and fish and wildlife habitat would be increased.

4.1.5 Mitigation

Conditions for vegetation and wildlife resources with the multilevel intake structure alternative are not likely to be significantly worse than without-project conditions. The Byrd Slough habitat restoration would improve conditions for vegetation and wildlife. Therefore, no mitigation would be necessary for the multilevel intake structure and Byrd Slough habitat restoration alternatives.

4.2 FISHERIES

This section evaluates the effects of the alternatives on fishery resources in the study area. The significance of these effects was evaluated using the same criteria as in Section 4.1.

4.2.1 No Action

This alternative assumes that the Federal Government would not participate in constructing and operating a multilevel intake structure or restoring the Byrd Slough restoration site. Existing conditions such as high temperatures that adversely affect fishery resources would continue. Other factors adversely affecting the fishery in the lower Kings River include loss of riparian and oak woodland, SRA, and wetland habitats in the Kings River basin; changes in timing of flows in the lower Kings River; and depletion of coldwater fish spawning habitat.

The lack of temperature control flexibility in water releases would continue to be a major constraint in sustaining a coldwater fishery in the lower Kings River. Outlet water temperatures in the lower Kings River are known to significantly exceed target values needed to sustain a coldwater fishery when the reservoir is low or when releases are too low to draw coldwater through the penstocks, necessitating warmwater releases through the mid-level gates.

The river has supported a coldwater fish population when there are several consecutive wet years, but experiences coldwater fish mortality during normal to dry water years. Without a multilevel intake structure, the fishery would continue to exhibit fluctuations in community dominance, with periodic thermal stress leading to elimination of coldwater fish. For all except consecutive wet years, the community would be dominated by nongame native suckers and minnows (FWS, 1996).

Future conditions for the coldwater fishery in the lower Kings River would likely decline without the project. Based on the FWS's CAR and HEP, under no action, available habitat for the trout (indicator species for aquatic habitat) begins to decline in the beginning of July for all year types as a result of thermal inputs and progressive depletion of coldwater reserves. For a normal water year, baseline conditions almost eliminate the trout fishery. The amount of available habitat for the trout declines to almost zero in the beginning of September. For a dry water year, the amount of available trout habitat declines to zero from August

15 through September. Under no action, for a critically dry water year, the conditions extend the extinction period from August 4 through September 5.

Under the Kings River Fisheries Management Program Framework Agreement, the DFG, KRCD, and KRWA are continuing to study, and intend to implement, additional components of the fisheries management program, including additional spawning gravel and rearing channels and habitat restoration projects, as well as fish stocking, enforcement, public information and education, stream monitoring, and program funding.

4.2.2 Multilevel Intake Structure

When late summer or early fall (July to October) water storage is low in Pine Flat Lake, the Kings River below Pine Flat Dam is subject to high water temperature releases, adversely affecting the coldwater fishery. One cause of this condition is limited flexibility in dam operation. The penstock level release of Pine Flat Dam cannot be used when the release is less than 500 to 600 cfs or the water-surface elevation of the lake is less than 715 feet above mean sea level (15 percent of capacity). Switching to the higher, mid-level sluices can result in warmer river temperatures, while switching to the low-level sluices would prematurely use up the coldest water in the lake.

When Pine Flat Lake levels are generally at or above an elevation of 810 feet, water of suitable temperature for coldwater fish habitat is available at lake levels much higher than 650 feet. A multilevel intake structure would allow selective withdrawal of water from the upper lake levels, between 717.5 and 857.5 feet, to provide release water temperatures to the Kings River below Pine Flat Dam of 18 ^{0}C or lower. In addition, this allows the much colder water in the lower elevations of the lake between 650 feet and 750 feet to be preserved for use later in the season when water temperatures increase. Installation of a multilevel intake structure would allow for greater flexibility in water releases and in managing coldwater storage to improve fish habitat. This coldwater management would be sufficient to allow survival of adult coldwater fish, although temperatures could still approach survival limits. The multilevel intake structure would also reduce the magnitude of abrupt temperature jumps caused by changing the existing release outlet ports. Elimination of these jumps would reduce stress on the coldwater fishery and reduce adverse effects to aquatic organisms, which serve as food for the fish.

Effects on fishery resources were evaluated in conjunction with the FWS during coordination under the Federal Fish and Wildlife Coordination Act. The FWS prepared the draft CAR, including a HEP, to determine the effects of the multilevel intake structure and water transfer pipeline on rainbow trout, which was used as the indicator species for the effects on the aquatic ecosystem. (The water transfer pipeline was later eliminated from further consideration due to high construction costs, limited benefits, and potential significant adverse

environmental effects.) The draft CAR discusses in detail the benefits to fish habitat of the multilevel intake structure. The habitat values for the multilevel intake structure are presented in weighted useable area (WUA). WUA is defined as the amount of usable habitat in a river for juvenile, adult, and other life cycle stages of rainbow trout as the indicator species for the effects on aquatic habitat, based on association between fish and average water velocities, depths, and substrate size, expressed as habitat suitability curves. Changes in the WUA as a function of water discharge (in cubic meters per second) and the closely related variable river channel width (meters) can be used to illustrate the importance of discharge to different life cycle stages of rainbow trout in maintaining diversity in channel form and flow.

The basis of the habitat analysis was data compiled from the Kings River Fisheries Investigation Instream Flow Study conducted in 1992 by Trihey and Associates and Entrix, and modeling work conducted by KRCD from 1996 to 1999. The FWS used flow and temperature data, provided by KRCD, to evaluate the various fishery habitat restoration alternatives. The FWS applied these data to appropriate WUA curves developed from the 1992 instream flow study for each year type (dry, very dry, and normal) for 13 one-mile segments of the Kings River from Pine Flat Dam to Highway 180. The data from the fishery habitat restoration alternatives were then analyzed to determine the benefits to adult, juvenile, and fry trout life stages. Dry, very dry, and average years were based on actual data records from years 1988, 1992, and 1994, respectively. Using the 1992 instream flow study, the FWS calculated WUA values based on flows for each scenario and then applied a suitability index (based on coldwater fishery critical temperatures) curve to modify resultant WUA values by temperature criteria. The index value ranged from zero to 1, and modified WUA values were generated based on temperature by multiplying the suitability index number by the WUA value. These numbers were then multiplied by the actual frequency of water years that are normal (53 percent), dry (16 percent), and critically dry years (7 percent).

Table 4-1 shows the resulting total WUA for the baseline condition and multilevel intake structure for 1994 (normal year), 1992 (critically dry year), and 1988 (dry year). The total benefits (WUA gained) for the multilevel intake alternative is the average of the differences between the baseline conditions and the multilevel intake alternative for the three year types. Additional detailed information on these selected years and modeling scenarios is included in Appendix A.

4.2.3 Byrd Slough Habitat Restoration

Allowing riparian and SRA habitat at the Byrd Slough site to regenerate naturally and installing oak woodland plantings and an irrigation system would indirectly benefit the coldwater fishery in the lower Kings River. The restored habitat would eventually provide more shade, insects, and aquatic organisms for

fish, as well as forage from the forest canopy. This would facilitate developing, reproducing, and future growth towards the lower Kings River. Once riparian and SRA habitat have regenerated and oak woodland habitat has been replanted and irrigated, the Byrd Slough site could help stabilize the lower Kings River and the aquatic ecosystem. Discontinuing grazing practices, allowing the restoration site to regenerate, and installing oak woodland plantings could also benefit the lower Kings River fishery by decreasing contamination (from livestock) and erosion, thus improving water quality.

Table 4-1. Total WUA[1] for Baseline and Multilevel Intake Structure Alternative

WUA Total	Baseline	MLI[2]
Normal 1994	128	162
Δ		34
Critical Dry 1992	82	130
Δ		48
Dry 1988	95	134
Δ		39
Total	305	426
Avg	102	142
Δ Avg		40[3]

[1] Weighted usable area
[2] Multilevel intake structure
[3] Total benefits

4.2.4 Combined Restoration Plan

The combined restoration alternative would consist of a combination of the direct effects of the multilevel intake structure and indirect effects of the Byrd Slough habitat restoration to fish resources. Temporary, minor disturbances would occur during construction of the multilevel intake structure in the short-term, but in the long-term, overall fish habitat values would be increased.

4.2.5 Mitigation

Since there would be no significant adverse effects on fisheries, no mitigation would be required.

4.3 SPECIAL STATUS SPECIES

This section evaluates the effects of the alternatives on special status species in the study area. Any project action which would affect the continued existence of an endangered or threatened species or a species of special concern is considered to be a significant adverse effect. For listed species adversely affected by the project, a significant effect would occur if project alternatives directly or indirectly resulted mortality or in the partial or complete destruction of critical habitat in the project area. (These significance criteria are consistent with the provisions of the FESA.) In addition, elimination or substantial degradation of critical habitat would constitute a significant effect under NEPA and CEQA.

The KRCD conducted surveys for San Joaquin kit fox and California red-legged frogs on the Byrd Slough Habitat Restoration Site in early October 2001 and determined that neither species was found on the project site. The evaluation of the effects of the alternatives on all other special status species and their associated habitats are based on a worst-case scenario. Additional surveys would be conducted prior to construction in order to ensure avoidance of any other listed species or critical habitats.

4.3.1 No Action

The no-action alternative assumes that the Federal Government would not participate in ecosystem restoration. Since no significant change in vegetation or wildlife resources is anticipated, no significant change in habitat or endangered species values is anticipated with the no-action alternative. Population fluctuations of any existing species would continue. No effects to listed species or critical habitats would result from no action.

4.3.2 Multilevel Intake Structure

No special status species is expected to be significantly adversely affected by the construction and operation of the multilevel intake structure because it would be constructed on the upstream portion of the dam face and dam operations would be similar. The Federally listed threatened and State-endangered bald eagle may winter at Pine Flat Reservoir near the dam. The State-listed threatened Swainson's hawk may seasonally occur in the reservoir area.

Bald Eagle

Pine Flat Reservoir is considered suitable foraging habitat for wintering bald eagles. Usually between 6 and 12 bald eagles over-winter in the Pine Flat Reservoir area and along the Kings River just downstream of Pine Flat Dam. Roosting occurs on Owl Mountain, Hog Mountain Point, at Sycamore and Big Creek Coves, and at Mill Flat on the upper Kings River. All of these sites are several miles away from Pine Flat Dam. Along the Kings River downstream of

Pine Flat Dam, there is usually a pair of bald eagles that spend the winter near the confluence with Mill Creek, which is approximately 1.7 miles downstream of the dam. Occasionally, a few other eagles are observed in the lower river, but most use the reservoir. Nesting has not been documented in the Kings River drainage. The critical wintering period for bald eagles extends from November 15 through March, with their critical breeding period typically from January 31 through June 15.

The bald eagle may be temporarily disturbed or displaced during construction of the multilevel intake structure due to human noise and activity. However, prior to any work being performed, pre-construction surveys for bald eagles would be conducted. Based on the results of the surveys, specific avoidance and minimization measures would be developed and implemented to reduce any potential adverse effects to less than significant. The minimum distances for construction activities from active nest and roost sites would vary depending on type of activity and visual proximity, but would usually range from 400 to 800 meters. Overall, the project would provide for improved fishery habitat, which would increase forage for over-wintering bald eagles.

Species of Concern

Species of special concern that may be temporarily disturbed or displaced during multilevel intake structure construction include the prairie falcon and spotted bat. However, in the long-term, these species would benefit from the restoration of fish and wildlife habitat resources. Fish species of special concern that may benefit from operation of the multilevel intake structure include hardhead, Kern brook lamprey, and California roach.

4.3.3 Byrd Slough Habitat Restoration

Listed animal species that could occur at the Byrd Slough restoration site include the Federally threatened valley elderberry longhorn beetle and California red-legged frog and State-endangered little willow flycatcher. The State-listed threatened Swainson's hawk may seasonally occur in the restoration area. Listed plant species that could occur at the Byrd Slough restoration site include the Federally endangered San Joaquin woolly threads, Federally and State-endangered palmate-bracted bird's-beak and California jewelflower, Federally threatened Hoover's eriastrum, Federally threatened and State-endangered San Joaquin adobe sunburst, and Federally proposed threatened and State-threatened tree-anemone (Kelly, 1999).

Valley Elderberry Longhorn Beetle

This beetle is closely associated with blue elderberry (*Sambucus mexicana*), an obligate host for beetle larvae. There is potentially suitable beetle habitat (elderberry shrubs) in the Byrd Slough restoration site, but no adult

beetles or emergence holes were observed during 1998 field surveys (JSA, 1998a). An additional survey was conducted on September 28, 2001, with KRCD and a representative from the U.S. Fish and Wildlife Service. During the site visit, several elderberry shrubs were identified and mapped by the FWS. Based on their location, all elderberry shrubs would be avoided, and any work would occur at least 100 feet away from any shrub. As a result, no beetle habitat would be adversely affected at the Byrd Slough restoration site.

California Red-Legged Frog

California red-legged frogs require permanent or nearly permanent pond water habitat, including stock ponds and pools within streams, with emergent and submergent vegetation. California red-legged frogs may be found far from water. Potentially suitable aquatic and riparian habitats occur at the Byrd Slough Restoration Site. However, the Byrd Slough Habitat Restoration Site is outside the current range of the California red-legged frog. No current or historic frog records are known from the Byrd Slough site, and the California Natural Diversity Data Base (NDDB) does not show any frog records from the Piedra 7.5-minute quadrangle or the eight surrounding quadrangle maps.

California red-legged frog surveys were conducted at the Byrd Slough Habitat Restoration Site between October 8 and October 10, 2001. Day and night surveys were recorded, and results indicated the presence of several bullfrogs in a few isolated ponds within the largely dry slough. No California red-legged frogs were observed within Byrd Slough during this survey. The survey also concluded that the annual occurrence of high flows (6,000 cfs) for several months, low flows (100 cfs) for several months, lack of hiding cover at low flows, cobble substrate, lack of submergent vegetation, and predatory coldwater and warmwater fishes render the Kings River unsuitable for red-legged frog as well. As a result of these surveys, the California red-legged frog does not occur on the project site and would not be adversely affected by construction activities (see Appendix C).

San Joaquin Kit Fox

The San Joaquin kit fox inhabits grasslands and scrublands, many of which have been extensively modified. Types of modified habitat include agricultural mosaics of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands. Oak woodland, alkali sink scrubland, and vernal pool and alkali meadow communities also provide habitat for kit foxes. Kit foxes are thought to inhabit suitable habitat on the San Joaquin Valley floor and in the surrounding foothills of the coastal ranges, Sierra Nevada, and Tehachapi Mountains.

San Joaquin kit fox surveys were conducted on October 5, 2001, at the Byrd Slough Habitat Restoration Site. The entire project site was surveyed. One

inactive coyote den was located in the northeastern area of the parcel. No tracks, prey remains, or recent scat was observed near the den. One adult coyote was observed in the southeastern area of the parcel. Coyote scat was found throughout the project site. No California ground squirrels or their burrows were observed on the site. No evidence of the kit fox such as dens, tracks, scat, or potential dens were found. As a result of this survey, it is concluded that the San Joaquin kit fox does not occur on the project site and would not be adversely affected by construction activities (see Appendix C).

Little Willow Flycatcher

The little willow flycatcher, a subspecies of willow flycatcher primarily inhabits willows in riparian deciduous shrub habitat. The nearest known little willow flycatcher population to the project sites is near Shaver Lake, Fresno County, approximately 25 miles north of the Byrd Slough restoration area. Other known willow flycatcher locations are above an elevation of 4,800 feet in Fresno County (DFG, 1997).

The Byrd Slough restoration site lacks extensive willow habitat in riparian areas and is at a much lower elevation than recorded sightings. It is unlikely that the willow flycatcher occurs at the restoration site, although it could occur there during the spring or fall migration.

San Joaquin Woolly Threads

Habitat for San Joaquin woolly threads is restricted to alkaline and loamy plains in chenopod scrub, sandy valley, and foothill grassland at 300 to 2,300 feet above sea level. The restoration site does support several areas of sandy valley and foothill grassland that could provide suitable habitat for San Joaquin woolly threads. Because suitable habitat for this species occurs at the restoration site, pre-construction surveys would be conducted to avoid potential adverse effects to San Joaquin woolly threads.

Palmate-Bracted Bird's-Beak

Palmate-bracted bird's-beak is found on alkaline flats in chenopod scrub and valley and foothill grassland below 200 feet above sea level (Hickman, 1993). The restoration site does support several areas of chenopod scrub, valley, and foothill grassland that could provide suitable habitat for palmate-bracted bird's-beak. Because suitable habitat for this species occurs at the restoration site, pre-construction surveys would be conducted to avoid potential adverse effects to palmate-bracted bird's-beak.

Hoover's Eriastrum

The Byrd Slough restoration site does support several areas of chenopod scrub that could provide suitable habitat for Hoover's eriastrum. Because suitable habitat for this species occurs at the restoration area, pre-construction surveys would be conducted to avoid potential adverse effects to Hoover's eriastrum.

California Jewelflower

California jewelflower is typically found at an elevation between 210 and 3,300 feet on flats and gentle slopes in non-alkaline grassland, in chenopod scrub, open pinyon-juniper woodland, and valley and foothill grassland. No adverse effects on California jewelflower are expected in the project area. However, suitable grassland habitat is present at the Byrd Slough restoration site. Because suitable habitat for this species occurs at the restoration site, pre-construction surveys would be conducted to avoid potential adverse effects to California jewelflower.

Tree-Anemone

Tree-anemone is found at an elevation between 1,500 feet and 3,300 feet on streambanks and granite substrates in chaparral and oak woodland habitats. No adverse effects on tree-anemone are expected in the project area. However, suitable oak woodland habitat is present at the Byrd Slough restoration site. Because suitable habitat for this species occurs at the restoration area, pre-construction surveys would be conducted to avoid potential adverse effects to tree-anemone.

San Joaquin Adobe Sunburst

San Joaquin adobe sunburst is found at an elevation between 330 and 2,600 feet on bare, dark clay soils in valley and foothill grassland and oak woodland habitats. No adverse effects on San Joaquin adobe sunburst are expected in the project area. However, suitable grassland and oak woodland habitat is present at the project site. Because suitable habitat for this species occurs at the Byrd Slough restoration site, pre-construction surveys would be conducted to avoid potential adverse effects to San Joaquin adobe sunburst.

Species of Concern

Other species of special concern that may occur at the Byrd Slough restoration site include Foothill yellow-legged frog, southwestern pond turtle, California horned lizard, San Joaquin whipsnake, prairie falcon, western burrowing owl, fringed myotis, long-eared myotis, small-footed myotis, long-legged myotis, Yuma myotis, greater western mastiff-bat, and Pacific Townsend's (western) big-eared bat. Other plant species of special concern that may occur at the Byrd Slough restoration site include heartscale, Lost Hills

crownscale, lesser saltbush, forked fiddleneck, pale-yellow layia, obovate-leaved thornmint, and South Coast Range morning-glory. Detailed information on these species is included in Appendix B.

4.3.4 Combined Restoration Plan

Temporary, minor disturbances would occur during construction and restoration activities in the short-term, but in the long-term, overall fish and wildlife habitat values would be increased. Pre-construction surveys would be conducted to avoid listed species and critical habitats.

The combined restoration alternative would consist of a combination of the effects of the multilevel intake structure and Byrd Slough habitat restoration. Endangered and threatened species, species of special concern, and critical habitats would be avoided during ecosystem restoration activities. As a result, no special status species or critical habitat would be adversely affected by the alternative. In addition, several habitats of potential value to endangered and threatened species would benefit, including aquatic habitat for fish resources and riparian, SRA, seasonal wetland, and oak woodland habitats for terrestrial species.

4.3.5 Mitigation

If necessary, additional pre-construction surveys would be conducted by qualified biologists to avoid listed species or critical habitats. Preventative measures and best management practices would be implemented to avoid adversely affecting special status species or critical habitats. These measures and practices would consist of pre-project surveys for special status species and potential critical habitat at the Byrd Slough restoration site, conducting worker awareness training, and having a qualified monitoring biologist on site during restoration activities. Any special status plant species or potential critical habitat discovered during pre-project surveys would be fenced, flagged, and avoided during restoration activities. Therefore, no mitigation would be required.

Site visits would be conducted by a qualified biologist before, during, and after construction to ensure compliance with avoidance measures for special status species and habitats. The results of the biologist's visits would be forwarded to the appropriate resource and regulatory agencies. If during construction the Corps determines that a listed species or critical habitat cannot be avoided, formal Section 7 consultation would be initiated with FWS to determine mitigation requirements.

A biological assessment was submitted to FWS in September 2000. A supplemental biological assessment was submitted to FWS in November 2001. Preliminary informal consultation with the FWS indicates that formal consultation

would not likely be required for listed species or critical habitats that can be avoided by project restoration alternatives.

4.4 WATER QUALITY

This section identifies required permits and potential water quality effects, and recommends mitigation measures. In accordance with Section 404(b)(1) and Section 401 of the CWA (33 U.S.C. 1344) and other pertinent laws and regulations, the placement of dredged or fill materials below the ordinary high waters of the U.S. or their associated wetlands require evaluation of water quality considerations related to the action. Since the Kings River and Pine Flat Reservoir are protected under the CWA, the project must comply with applicable provisions. However, this project does not include activities that would result in discharge of dredged or fill materials into waters of the U.S., and therefore would not require Section 404(b)(1) and Section 401 permits. The proposed activity would not violate State and Federal water quality standards.

The U.S. EPA and the California Department of Health Services regulate the primary water quality standards in California's surface and ground drinking water (EPA, 1972; EPA, 1973; The Resources Agency, 1993). The State standards must at least equal Federal standards but are often more stringent. Secondary standards (not health-based) are additional criteria used to determine urban, industrial, and agricultural water quality. Water intended for human consumption must be monitored routinely and conforms to State and Federal health standards. Project effects in exceedance of these health standards would be considered significant and would require monitoring and treatment.

To determine the level of significance the proposed project would have on water quality, local experts were consulted to identify the existing conditions. Existing water quality conditions were then compared with State and Federal standards and the projected water quality conditions resulting from the proposed project.

4.4.1 No Action

Under the no-action alternative, no significant change in water quality in Pine Flat Reservoir would likely occur although low dissolved oxygen levels and warm water temperatures would occasionally recur in the reservoir. In the lower Kings River, significant long-term problems with low flow and warm temperatures would continue without the project. Other downstream water quality problems such as salinity and high boron and arsenic levels would be associated with increased urbanization and erosion caused by increased flows, grazing, and irrigated fields.

4.4.2 Multilevel Intake Structure

A multilevel intake structure would allow releases to be made from various reservoir levels, according to downstream needs. Construction of the multilevel intake structure on the lakeside face of Pine Flat Dam would not include the dredging or placement of fill material into waters of the U.S. since the constructed features would be attached to the existing concrete dam and would never contact the surface of the ground. Proposed construction materials for the multilevel intake structure are predominantly steel structures that would be welded together and placed underwater. Because the structure does not constitute fill or dredged material, an evaluation of water quality effects under Section 404(b)(1) is not necessary.

Previous analyses showed that the multilevel intake structure would conserve available cold water longer in the year, prolonging the period of suitable habitat within the reservoir for both coldwater and warmwater fish (Corps 1994). This would be a long-term beneficial effect to water quality in the reservoir. There would be short-term adverse effects in the reservoir during construction of the multilevel intake structure. Lower water levels, higher water temperatures, and increased concentrations of pollutants due to construction activities would be possible. However, the use of best management practices and a water quality monitoring program would reduce any adverse effects to less than significant. Best management practices would consist of regular watering of construction surfaces with water trucks to prevent wind erosion of dust into water resources, temporary berms to prevent materials from eroding in or near water resources, refueling equipment in designated areas, monitoring and maintaining equipment for fuel leaks regularly, and reseeding soil areas with native grass to prevent soil erosion from surface water runoff. A water quality monitoring program, which includes water testing, would be conducted to alert construction representatives if levels of pollutants have increased above standards set by the U.S. EPA and Regional Water Quality Control Board.

The operation of a multilevel intake structure would have a long-term benefit on the overall water temperature for fisheries in the lower Kings River. The ability to release water from various reservoir elevations would improve the water quality downstream by allowing improved spatial habitat, dissolved oxygen levels, and colder water temperatures year-round.

4.4.3 Byrd Slough Habitat Restoration

This alternative involves activities that fall within Department of the Army Nationwide Permit No. 27, Wetland and Riparian Restoration and Creation Activities. This restoration project would serve the purpose of restoring "natural" wetland hydrology, vegetation, and function to altered and degraded nontidal wetlands and "natural" functions of riparian areas of the site.

Restoring the riparian and oak woodland corridors along the river would reduce erosion and promote habitat, therefore improving water quality by preventing soil runoff and lowering water temperatures. Another long-term benefit is replacing abandoned irrigated pasture with riparian and oak woodland vegetation. This change in land use could benefit water quality by reducing the amount of nitrate runoff and also benefit the native surroundings by reducing soil compaction resulting from years of cattle grazing.

Downstream water quality would not be adversely affected by this alternative because the alternative would encourage natural regeneration and establish oak woodland plantings, therefore reducing the amount of soil compaction and erosion along the lower Kings River. Riparian habitat would regenerate along the lower Kings River, and the shade would result in lower water temperatures, nutrients, and cover for fish habitat.

4.4.4 Combined Restoration Plan

The combined restoration alternative would consist of a combination of the effects of the multilevel intake structure and Byrd Slough habitat restoration to water quality. Temporary, minor disturbances would occur during construction of the multilevel intake structure in the short-term, but in the long-term, water quality for fish and wildlife habitat would be increased. The Byrd Slough restoration site alternative would have no adverse effects to water quality.

4.4.5 Mitigation

Best management practices would be implemented to protect water quality for the project alternatives. A water quality monitoring program would be implemented during construction. Best management practices would consist of regular watering of construction surfaces with water trucks to prevent wind erosion of dust into water resources, temporary berms to prevent materials from eroding in or near water resources, refueling equipment in designated areas, monitoring and maintaining equipment for fuel leaks regularly, and reseeding soil areas with native grass to prevent soil erosion from surface water runoff. A water quality monitoring program, which consists of water testing, would be conducted by the construction contractor and KRCD to alert construction representatives if levels of pollutants have increased above standards set by the U.S. EPA and Regional Water Quality Control Board.

4.5 AIR QUALITY

This section identifies potential adverse effects to air quality and recommends mitigation measures. The following literature sources were consulted in evaluating regional, State, and Federal air quality background and standards for the project area:

- California Office of Planning and Research. California Environmental Quality Act Statutes and Guidelines, 1992.
- California Office of Planning and Research. CEQA Air Quality Handbook, 1992.
- California Air Resources Board. Annual Air Quality Data Summary, 1993.
- U.S. EPA. AP-42 Report, 1985.
- SJAPCD. Adopted Ozone Attainment Demonstration Plan, 1994.
- SJAPCD. Serious Area PM_{10} Plan, 1994.

Air pollutant threshold limits in tons per year (tons/year) and pounds per day (lbs/day) were obtained from the Code of Federal Regulations (CFR) and the SJAPCD, respectively (40 CFR 6, 51, 93; SJAPCD, 1994a, 1994b). The SJAPCD has established certain criteria for determining the significant of the effects on the local air basin. These criteria comply with State and Federal standards for identified air pollutants, and identify threshold limits for the air basin for pollutants, which exceed State standards. Table 4-2 shows the National and SJAPCD standards for air pollutants or air quality thresholds of significance for the project area.

The significance of a pollutant emission is determined by comparing it with the appropriate Federal and/or State standard. For this study, a significant air quality effect is defined as one which would "violate any air quality standard, contribute substantially to an existing or projected air quality violation, delay attainment of a Federal or state standard, or expose sensitive receptors to substantial pollutant concentrations." (CEQA, 1992; U.S. EPA, 1994; SJAPCD, 1994).

Table 4-2. National and SJAPCD Standards for Air Pollutants

Pollutant	National Standard (tons/year)	SJAPCD Standard (pounds/day)
Carbon monoxide (CO)	100	9 ppm[1]
Reactive organic gases (ROG)	50	55
Nitrogen oxides (NO_x)	50	55
Sulfur oxides (SO_x)	100	55
Particulate matter (PM_{10})	70	55

[1]parts per million

For a project-level air quality analysis, the SJAPCD has adopted the National Ambient Air Quality Standards as local thresholds of significance not to be exceeded as listed in the General Conformity Rule (40 CFR 93.153). Pollutant emissions, which equal or exceed the National Ambient Air Quality Standards and/or SJAPCD's designated threshold levels for construction emissions are considered significant and need to be mitigated.

The General Conformity Rule covers direct and indirect emissions of criteria pollutants or their precursors. Direct emissions are those emissions caused by or initiated by a Federal action and occur at the same time and place as the action. Indirect emissions are those emissions that (a) can be caused by a Federal action, but may occur later in time and/or may be farther removed in distance from the action itself, but are reasonably foreseeable and (b) the Federal agency can practicably control, and will maintain control over due to a continuing program responsibility (40 CFR 93.152).

Tables 4-3 and 4-4 list the construction equipment, type of fuel used, horsepower of engine, total hours of equipment operation for the construction period, total criteria pollutant emissions in tons/year, and total criteria pollutant emissions in lbs/day for the multilevel intake structure and Byrd Slough habitat restoration alternatives. The thresholds for Federal annual emissions (in tons/year) and State daily emissions (in lbs/day) are also shown at the bottom of Tables 4-3 and 4-4. The amounts of criteria pollutant emissions generated during construction were estimated based on the construction equipment operating simultaneously 8 hours a day for 5 days a week for the designated construction period. Also, the amount of fugitive dust (PM_{10}) was considered in the generation of emission estimates. Estimates of daily emissions (in lbs/day) were determined by multiplying hours of operation for each type of equipment (8 hours/day) by its pollutant emission factor, and a resultant amount of pollutant in pounds was generated. Estimates of annual emissions (in tons/year) were determined by multiplying hours of operation for each type of equipment for each year of the construction period (24 months) by its pollutant emissions factor, which resulted in annual pollutant emissions in pounds. Emission factors for criteria pollutants were taken from Tables A9-8-A and A9-8-C of the CEQA Air Quality Handbook (1992) and U.S. EPA AP-42, Volume 2. The total pounds of annual pollutant emissions were then converted to the equivalent in tons/year.

With the project, short-term effects to air quality would occur. The direct construction effects to air quality are estimated in Tables 4-4 and 4-5. This short-term increase in particulates and emissions is considered an unavoidable effect. However, the emissions from construction are predicted to be less than the threshold levels in 40 CFR 93.1543 and are therefore exempt from the requirement of an individual conformity determination. The predicted short-term emissions are also not expected to exceed SJAPCD's threshold of significance for daily construction effects. In accordance with the SJAPCD's Air Quality Handbook, mitigation measures would be implemented to further reduce the effect. The long-term emissions in the area would likely remain about the same because the change in project operation and maintenance would remain about the same.

4.5.1 No Action

This alternative assumes that the Federal Government would not participate in constructing the ecosystem restoration project. Without Federal participation, the project would not be constructed, and no pollutants would be generated by project construction and operation. Dam operational and recreational activities would continue at Pine Flat Lake and Dam. Existing agricultural operations in the vicinity of the project would continue, including disking, planting, harvesting, and maintaining road and irrigation ditches. These activities would require the use of heavy equipment. Recreational activities at the Byrd Slough restoration site would continue with cattle grazing.

Regional air pollution emission rates would not change as a result of this action. However, regional air quality may improve over time as stricter emission-reducing regulations are implemented.

4.5.2 Multilevel Intake Structure

Construction of the multilevel intake structure requires construction equipment, as mobile sources of emissions, to operate for a 24-month period. Construction activities would be limited to 8-hour work days and 5-day work weeks. During the summer months (June through August), construction would start at 6 a.m. and end at 3 p.m. During the remaining months, construction would start at 7 a.m. and end at 4 p.m. Equipment operation during the construction of the multilevel intake structure would consist of about 72 equipment hours per day or a total of 18,841 equipment hours for the entire construction period.

Construction activities would consist of moving and placing prefabricated metal structures to install a multilevel intake structure at Pine Flat Dam. Heavy construction equipment (cranes, trucks, and tug boat) would be used for placing multilevel intake structure materials. This equipment would generate pollutants from internal combustion engines (gasoline- and diesel-powered engines). These pollutants, or combustion emissions, would include ozone precursors CO (32.3 lbs/day, 7.8 tons/year), ROG (23.7 lbs/day, 1.9 tons/year), NO_x (53.8 lbs/day; 17 tons/year), SO_x (19.7 lbs/day, 1.6 tons/year) and PM_{10} from combustion (23.7 lbs/day, 1.9 tons/year).

Table 4-3 shows the construction equipment, fuel, horsepower, hours of operation, and construction emissions in tons per year and pounds per day for the multilevel intake structure compared to Federal, State, and SJAPCD *de minimis* standards (thresholds of significance) for criteria pollutants CO, ROG, NOx, SOx, and PM_{10}. Daily equipment emissions (pounds/hour) were determined from the total hours of operation for each type of equipment used. These emissions represent a worst-case scenario and assume operation of all equipment simultaneously for 24 months.

The SJVAB is in severe nonattainment for ozone and nonattainment for PM_{10}, resulting in emission standards that are more stringent than overall State and Federal standards for criteria pollutants. Construction emissions, which equal or exceed the SJAPCD thresholds, are considered significant and require mitigation. Regulation VIII requires that specific management measures be implemented for minimization of project-generated fugitive dust/PM_{10} (SJAPCD, 1995). In addition, Federal projects which result in emissions that equal or exceed *de minimis* threshold levels established by the General Conformity Rule of the Clean Air Act must prepare a Conformity Determination (EPA, 1994).

Project emissions generated by construction equipment for the multilevel intake structure would not exceed the SJAPCD or Federal thresholds for ozone precursors CO, ROG, NO_x, SO_x, or PM_{10}. Of the criteria pollutants analyzed, no air quality effects for criteria pollutant emissions are expected to result from the construction phase of this alternative. Criteria pollutant emissions are below the

Federal thresholds in tons/year and State and local thresholds in lbs/day. Construction activities in the Pine Flat Reservoir area would be restricted to the spillway and damsite area. Air quality effects would be direct, short-term, and construction related Best management practices would be implemented to further reduce criteria pollutant emissions to a less that significant level.

In addition to criteria pollutant emissions from construction equipment, construction activities would also cause fugitive dust/particulate emissions. This fugitive dust could be generated by clearing, excavation, and concrete removal; operating construction vehicles on unpaved ground; and wind blowing over exposed earth surfaces. Fugitive emissions generated by major dam-site improvement projects are generally localized and short-term and do not often exceed the National Ambient Air Quality Standards. The approximate affected area and construction period for the multilevel intake structure are 2.07 acres (staging area) and 24 months. Based on the U.S. EPA's dust generation factor, the fugitive dust emissions for the multilevel intake structure are 1.2 tons (unmitigated) for the specified construction period. The multilevel intake structure would be constructed over 2 years, which would minimize the PM_{10} emissions to 0.6 ton/year. Since the Federal threshold is 100 tons/year, construction of the multilevel intake structure would not constitute a significant short-term effect on air quality at only 0.6 ton/year.

Project emissions generated by construction equipment for the multilevel intake structure would not exceed the local or Federal thresholds for ozone precursors CO, ROG, NO_x SO_x and PM_{10}. Given the worst-case scenario, equipment emissions would be very close to daily (not yearly) local thresholds for the ozone precursor, NO_x, and would be subject to mitigation measures identified in Section 4.5.5. The rural location of the project improves the opportunity for dissipation of ozone precursors away from urban centers and sensitive receptors.

Table 4-3

Table 4-3. Multilevel Intake Structure Construction Emissions For Criteria Pollutants

MULTILEVEL INTAKE STRUCTURE	(G) gas	horse-	Total		Criteria Pollutant Emissions (lbs/hp/hr)[4]						Criteria Pollutant Emissions (lbs/day)[2]				
CONSTRUCTION EQUIPMENT LIST [1]	(D) diesel	power	Hours		CO	ROG	NOX	SO_x	PM_{10}		CO	ROG	NO_x	SO_x	PM_{10}
CRANE, HYD, S/P, RT, 4WD, 20T/70' BOOM	D	105	164		105.3664	35.1288	269.3208	23.4192	35.1288		3.495744	1.02816	8.16	0.68544	1.02816
CRANE, HYD, TRK MTD, 60T/110' BOOM	D	234	5224		7461.186	2493.729	19118.69	1662.486	2493.729		6.673984	2.291328	8.16	1.527552	2.291328
CR, ME, CWLR, LIFTING, 450T/260' BOOM	D	519	1584		8149.278	1118.051	12857.58	1118.051	1118.051		3.24	3.388032	0.2592	3.388032	3.388032
GENERATOR, 225 KW, 240/480V, SKID	D	475	1240		4405.72	801.04	7209.36	801.04	801.04		3.24	3.1008	0.2592	3.1008	3.1008
GENERATOR, 5.0 KW, 120/240V, PORT	D	475	328		1165.384	211.888	1906.992	211.888	211.888		3.24	3.1008	0.2592	3.1008	3.1008
HWY, INE-TRUCK, W/AERIAL PLATFORM	D	165	16		10.7712	3.5904	37.6992	3.5904	3.5904		3.23136	1.07712	11.30976	1.07712	1.07712
TRK, HWY, 8, 600GVW, 4X4, 3/4 4 T--PKUP	D	137	9065		5078.152	1692.717	17773.53	1692.717	1692.717		2.683008	0.894336	9.390528	0.894336	0.894336
WELDER, 200 AMP, W/1AXLE TRLR	N/A	N/A	2398		0	0	0	0	0		0	0	0	0	0
WELDER, 300 AMP, W/1 AXLE TRLR	N/A	N/A	164		0	0	0	0	0		0	0	0	0	0
TUG BOAT, 500 TO 800 HP GAO	D	800	609		6528	979.2	7833.6	652.8	979.2		3.24	7.8336	8.16	5.2224	7.8336
FLOATING CRANE, 350T, 140FT BOOM	D	105	600		385.86	128.52	965.32	85.68	128.52		3.08448	1.02816	7.88256	0.68544	1.02816
MISC POWER TOOLS	N/A	N/A	6544												
SMALL TOOLS	N/A	N/A	45844												
SUBTOTAL			73789												
NO EMISSIONS			54946												
TOTAL			18841		31309.44	7463.864	67991.99	6251.671	7463.864		32.32858	23.74234	53.84045	19.68192	23.74234
THRESHOLD				Federal	100	60	60	100	70	State	9 ppm	55	55	55	55
				tons/yr	7.82736	1.86597	16.998	1.56292	1.86597	lbs/day[3]	32.3286	23.7423	53.8404	19.6819	23.7423

[1] Calculated using diesel-fueled equipment emission factors at .68% load (AP-42 Vol 2: A9-8-A and A9--8-C).

[2] Exhaust emission factors at 60% of each criteria pollutant (AP-42 Vol 2: Table A9-8-B) in lbs/day for all construction equipment operation

[3] Assume operation of all equipment simultaneously, 8 hours per day, 5 days per week.

[4] Construction period of 24 months for multi-level intake assumes 50% of total emissions for each year

It is expected that mitigation measures would maintain NO_x emissions below the level of significance.

4.5.3 Byrd Slough Habitat Restoration

Construction of the Byrd Slough habitat restoration requires construction equipment, as mobile sources of emissions, to operate for a 2-month period. Construction activities would be limited to 8-hour workdays and 5-day work weeks. During the summer months (June through August), construction would start at 6 a.m. and end at 3 p.m. During the remaining months, construction would start at 7 a.m. and end at 4 p.m. Equipment operation during the construction of the Byrd Slough habitat restoration would consist of about 40 equipment hours per day or a total of 164 equipment hours for the entire construction period.

Restoration activities would consist of soil preparation, installing plantings and an irrigation system, fencing, and wildlife structures along the lower Kings River. Heavy construction equipment (bulldozers, blades, rollers, and trucks) would be used for installing restoration site plantings and materials. This equipment would generate pollutants from internal combustion engines (gasoline- and diesel-powered engines). These pollutants, or combustion emissions, would include ozone precursors CO (22.6 lbs/day, 0.03 ton/year), ROG (6.7 lbs/day, 0.009 ton/year), NO_x (54.1 lbs/day, 0.095 ton/year), SO_x (9.5 lbs/day, 0.009 ton/year), and PM_{10} from combustion (7.2 lbs/day, 0.009 ton/year).

Table 4-4 shows the construction equipment, fuel horsepower, hours of operation, and restoration emissions in tons/year and lbs/day for the Byrd Slough restoration site construction compared to Federal, State, and SJAPCD *de minimis* standards (thresholds of significance) for criteria pollutants CO, ROG, NO_x, SO_x, and PM_{10}. Daily equipment emissions (lbs/hour) were determined from the 8 hours of operation for each type of equipment used. Annual equipment emissions (tons/year) were determined from the total hours of operation for each type of equipment used. These emissions represent a worst-case scenario and assume operation of all equipment simultaneously for 2 months.

Project emissions generated by construction equipment for the Byrd Slough restoration site would not exceed the SJAPCD or Federal thresholds for ozone precursors, CO, ROG, NO_x, SO_x, or PM_{10}. Of the criteria pollutants analyzed, no significant air quality effects are expected to result from the construction phase of this alternative. Criteria pollutant emissions are below the Federal thresholds in tons/year. Restoration activities would be restricted to the rural areas where sensitive receptors are not likely to occur. Air quality effects would be direct, short term and construction related. Best management practices would be implemented to further reduce criteria pollutant emissions to a less that significant level.

In addition to criteria pollutant emissions from restoration equipment, restoration activities would also cause fugitive dust/particulate emissions. This fugitive dust could be generated by clearing and planting; operating construction vehicles on unpaved ground; and wind blowing over exposed earth surfaces. Fugitive emissions generated by small restoration projects are generally localized and short-term and do not often exceed the National Ambient Air Quality Standards. The approximate affected areas and construction period for the Byrd Slough restoration site are 26.6 acres for the plantings and irrigation system and 2 acres for the staging area and 2 months. Based on the U.S. EPA's dust generation factor, the fugitive dust emissions for the Byrd Slough restoration site are 1.4 tons (unmitigated) for the specified construction period. The Byrd Slough restoration site would be constructed over a short duration, which would minimize the magnitude of PM_{10} emissions to 1.4 tons over the course of 2 months. Since the Federal threshold is 100 tons/year, construction of the Byrd Slough restoration site would not constitute a significant short-term effect on air quality.

Table 4-4. Byrd Slough Habitat Restoration Site Construction Emissions For Criteria Pollutants[1]

FRIANT-KERN CANAL RESTORATION SITE EQUIPMENT LIST	(G) Gas (D) Diesel	Horse-power	Total Hours		Criteria Pollutant Emissions (lbs/hp/hr)[4] CO	ROG	NOX	SO_x	PM_{10}		Criteria Pollutant Emissions (lbs/day)[2] CO	ROG	NO_x	SO_x	PM_{10}
HYDRA -PAK TAMPER, 21"W, 30"L, 27"H	N/A	N/A	10		NO EMISSIONS						NO EMISSIONS				
ROLLER, VIB, DD, S/P,11.1T, 80"W	D	111	16		8.45376	2.41536	24.1536	2.41536	2.41536		3.804192	1.086912	6.264	3.804192	1.086912
BLADE, STRAIGHT, HYDR, D-8	N/A	N/A	16		NO EMISSIONS						NO EMISSIONS				
DOZER, CWLR, D-8L, PS	D	95	16		10.336	2.0672	21.7056	2.0672	3.1008		4.6512	0.93024	9.76752	0.93024	1.39536
FLATBED, 8' x 9.0'	N/A	N/A	16		NO EMISSIONS						NO EMISSIONS				
TRK, HWY, 8,800GVW, 4x4, 3/4-PKUP	G	137	44		24.59424	8.19808	86.07984	8.19808	8.19808		4.024512	1.341504	13.68	1.341504	1.341504
TRK, HWY, 21,000 GVW, 4x2, 2 AXLE	G	170	16		11.0976	3.6992	38.8416	3.6992	3.6992		4.99392	1.66464	12.24	1.66464	1.66464
TRK, WTR, OF-HY, 5000GAL, W/CAT613C	D	175	8		5.712	1.904	19.992	1.904	1.904		5.1408	1.7136	12.24	1.7136	1.7136
MISC POWER TOOLS	N/A	N/A	10		NO EMISSIONS						NO EMISSIONS				
SMALL TOOLS	N/A	N/A	112		NO EMISSIONS						NO EMISSIONS				
SUBTOTAL			264												
NO EMISSIONS			184												
TOTAL			160		60.1936	18.28384	190.7726	18.28384	19.31744		22.61482	6.736896	54.19152	9.454176	7.202016
THRESHOLD				Federal	100	50	50	100	70	State	9 ppm	55	55	55	55
				tons/yr	0.0301	0.00914	0.09539	0.00914	0.00966	lbs/day[3]	22.6146	6.7369	54.1915	9.45418	7.20202

[1] Calculated using diesel-fueled equipment emission factors at .68% load (AP-42 Vol 2: A9-8-A and A9--8-C)

[2] Exhaust emission factors at 90% of each criteria pollutant (AP-42 Vol 2: Table A9-8-A and A9-8-C) in lbs/day for all construction equipment operation

[3] Assume operation of all equipment simutaneously, 8 hours per day, 5 days per week.

[4] Construction period of 2 months for restoration site

Project emissions generated by construction equipment for the Byrd Slough restoration site would not exceed the local or Federal thresholds for ozone precursors CO, ROG, NO_x, SO_x, and PM_{10}. Given the worst-case scenario, equipment emissions would come close to daily (not yearly) local thresholds for the ozone precursor NOx and would be subject to mitigation measures (Section 4.5.5). The rural location of the project improves the opportunity for dissipation of ozone precursors away from urban centers and sensitive receptors. It is expected that these mitigation measures would maintain NO_x emissions to below the level of significance.

4.5.4 Combined Restoration Plan

The combined restoration alternative would consist of a combination of the effects of the multilevel intake structure and Byrd Slough habitat restoration to air quality. Temporary, minor disturbances would occur during construction and restoration activities in the short-term, but in the long-term, overall fish and wildlife habitat values would be increased, which could indirectly improve air quality. Restoration of historic riparian, SRA, and oak woodland habitats could indirectly improve air quality in the project area in the long-term by absorbing carbon dioxide and generating oxygen.

4.5.5 Mitigation

Several measures would be taken to reduce any emissions to less than significant. First, construction contracts would be scheduled by the Corps so as not to exceed daily (lbs/day) local and State air quality thresholds in Fresno County for NO_x, CO, and PM_{10}. In addition, the contractor would use the best available control technologies (listed below) to minimize the adverse effects of construction on the air quality in the region. All standard practices and procedures set by the SJAPCD, the Air Resources Board, and the guidelines provided by the U.S. EPA to minimize emissions would be used during construction.

Construction equipment emissions are conservative estimates, assuming a worst-case scenario. Mitigation measure reduction credits were not included in the calculated estimates. It is estimated that the following measures would reduce the NO_x emissions by about 5 percent. To decrease the amount of dust and PM_{10}, unpaved haul roads, staging areas, and stockpile areas would be watered enough to keep them moist. It is estimated that the amount of PM_{10} emissions would be reduced by up to 75 percent if the soil is kept moist during the entire project. The construction contractor would implement the following mitigation measures to reduce the short-term air emissions.

Minimize Construction Equipment and Materials Emissions

The following mitigation measures would be used to reduce project-generated combustion emissions:

a. Ensure that all internal combustion engine equipment is properly tuned and maintained to manufacturer's specifications.

b. Keep vehicle idling to an absolute minimum. As a general rule, idling should be kept below 10 minutes.

c. Substitute electric-powered equipment for internal combustion-powered equipment, where feasible.

d. Develop a comprehensive construction activity management plan to minimize the pieces of construction equipment operating and the extent of the site area worked during any given time, especially during the smog season.

e. Use new technologies to control ozone precursor emissions as the technologies become available and feasible.

f. Avoid construction-related burning by using chipping, composting, and recycling.

g. Suspend construction equipment operations during second-stage smog alerts.

h. Use methanol, natural gas, propane, or butane-powered construction equipment, instead of diesel or gasoline.

i. Use gasoline-powered equipment that have catalytic converters.

j. Schedule the movement of construction materials during off-peak hours.

k. Use electricity from power poles rather than temporary generators.

l. Encourage employees to rideshare or carpool to the job site to reduce the amount of vehicle traffic to and from the project area.

m. During the smog season (May though October), the construction period would be lengthened to minimize the number of vehicles and equipment operating at the same level.

n. When available, cleaner burning fuel or electric equipment would be used in lieu of gasoline powered engines.

Minimize Construction Dust

The following mitigation measures would be used to reduce project-generated particulate emissions:

a. Use water trucks or sprinkler systems to keep airborne dust from leaving the site. Require increased watering frequency whenever wind speeds exceed 15 miles per hour (mph). Emphasize the watering of unpaved roadways during periods of high vehicle movement.

b. Enclose, cover, or water twice daily all soil/rock piles or install an automatic sprinkler system on all soil/rock piles.

c. Limit the speed for all construction equipment to 10 mph on any unpaved surface.

d. Stabilize all disturbed soil areas not subject to revegetation or paving with approved chemical soil binders, jute netting, or other methods approved in advance by the SJAPCD.

e. Do not excavate or grade soils during periods when wind speeds are greater than 20 mph averaged over 1 hour.

f. Water exposed soil with adequate frequency to keep soil moist at all times, at least twice daily.

g. Water all haul roads twice daily and/or pave all haul roads.

h. Maintain at least 2 feet of freeboard on trucks hauling loads of excavated materials and securely cover load of all haul/dump trucks securely.

Implementation of these measures would comply with SJAPCD's Regulation VIII Fugitive Dust/PM_{10} Synopsis and reduce project-related air quality effects (SJAPCD, 1995). Construction emissions, including fugitive dust, would not exceed Federal or State *de minimis* standards for any criteria pollutant. As a result, a conformity determination for the proposed ecosystem restoration project is not required.

4.6 LAND USE/PRIME AND UNIQUE FARMLAND

This section evaluates the direct and indirect effects of the alternatives on land use. Generally, factors that can affect future land use changes that are considered to be significant include increased/decreased availability of water, elimination of flooding, changes in cropping patterns, water delivery systems, and prime and unique farmlands going out of production.

Future land uses were determined by reviewing numerous planning documents. In addition, future conditions were estimated using maps, reports, hydrologic data, and site visits. Several knowledgeable people familiar with the project or the area were contacted to obtain their professional opinions about land use changes in the future, for both with- and without-project conditions. Their opinions were taken into account while making future projections.

A letter was received from the NRCS in 1999 (Appendix D). NRCS reported that no prime and unique farmland occurred in the project area.

4.6.1 No Action

This alternative assumes that the Federal Government would not participate in constructing the ecosystem restoration project. Without Federal participation, the project would not be constructed. Therefore, no changes in land use of Pine Flat Dam or the Byrd Slough restoration site would occur by the project construction and operation. This alternative would avoid project changes in land use.

Dam operational and recreational activities would continue at Pine Flat Lake and Dam. Existing agricultural operations in the vicinity of the project would continue, including disking, planting, harvesting, and maintaining road and irrigation ditches.

4.6.2 Multilevel Intake Structure

The multilevel intake structure would be installed on the reservoir side of the dam. No land use changes would occur due to installation of the multilevel intake structure. Pine Flat Dam would still be used mainly for flood control, water supply, power generation, and fish and wildlife resources.

4.6.3 Byrd Slough Habitat Restoration

No significant land use changes are expected from installation of the Byrd Slough restoration site. The restoration area would still be used for incidental recreation by anglers, boaters, and for wildlife viewing. Fencing would be designed to allow public access. However, the land would be preserved under a

conservation easement to protect the restoration area for wildlife habitat in perpetuity.

4.6.4 Combined Restoration Plan

The combined restoration alternative would consist of a combination of the effects of the multilevel intake structure and Byrd Slough habitat restoration to land use. Temporary, minor disturbances would occur during construction and restoration activities in the short-term, but in the long-term, overall fish and wildlife habitat values would be increased which could improve the quality of project land and associated uses. Restoration of historic riparian and oak woodland habitats would improve land use for recreation and wildlife viewing in the project area in the long term.

4.6.5 Mitigation

Since no significant land use changes are expected to result from the alternatives, no mitigation is required. Coordination has been completed with NRCS for potential effects to prime, unique, or statewide important farmlands due the project. A Farmland Conversion Impact Rating has been completed, and no mitigation is required based on NRCS evaluation.

4.7 CULTURAL RESOURCES

It is the policy of the Federal Government to use those measures, including financial and technical, which foster conditions under which modern society can coexist in productive harmony with its archeological and historical resources. Since the nation's historic properties are destroyed or substantially altered with increasing frequency, avoidance and preservation of cultural resources, to the extent feasible, is always the preferable alternative to mitigation. Likewise, CEQA guidelines direct public agencies to avoid damaging effect on archeological resources whenever possible.

Consideration would be given to measures that would avoid effects to and preserve cultural resources within the area of potential effect. These measures could include relocation of roads and disposal sites and covering sites with protective fill.

In those cases where avoidance preservation is not possible, affects to cultural resources are determined under the "criteria of effect" as defined in 36 CFR 800.5, "Protection of Historic Properties." These are the regulations implementing Section 106 of the National Historic Preservation Act. An "adverse effect" diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling or association. Adverse effects include, but are not limited to:

- Physical destruction, damage, or alteration of all or part of the property.
- Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualifications for the National Register.
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.
- Neglect of a property, resulting in its deterioration or destruction.
- Transfer, lease, or sale of the property.

For the EIS/EIR, these adverse effects are considered significant if the affected property is a site, building, structure, or object which is recognized as culturally or historically significant based on institutional, public, or technical criteria. The five criteria of adverse effect would not be applied to the cultural resources in the project area unless unknown sites are discovered during construction.

4.7.1 No Action

There would be no adverse effects to cultural resources due to the proposed project. However, adverse effects to cultural resources could take place without a project. Vandalism by amateur collectors, grazing activities, development, and natural causes all currently affect cultural resources. Pine Flat Dam would continue to be operated in the manner it is at present.

4.7.2 Multilevel Intake Structure

Pine Flat Dam, constructed in 1954, is less than 50 years old and is, therefore, not eligible for consideration to the National Register of Historic Places. Nevertheless, it has been examined with that criterion in mind for the near future. The dam is not unique in engineering or construction techniques and does not represent important technological advances in either engineering or construction. Construction of the multilevel intake structure would have no effect on any property eligible for, or listed in, the National Register of Historic Places.

4.7.3 Byrd Slough Habitat Restoration

At one time there was a house and barn located on the western periphery of the restoration area. These buildings were completely removed, and the ground was very disturbed in the process. There is no archeological potential for the area, and there is no person or event important in history associated with this house and barn. There would be no effect on any property eligible for, or listed in, the National Register of Historic Places.

4.7.4 Combined Restoration Plan

The combined restoration alternative would consist of a combination of the effects of the multilevel intake structure and Byrd Slough habitat restoration to cultural resources. No disturbance would occur during construction and restoration activities to cultural resources by implementing the project. There would be no effect on any property eligible for, or listed in, the National Register of Historic Places.

4.7.5 Mitigation

No mitigation would be required. Coordination with the State Historic Preservation Officer (SHPO) was concluded under Section 106 of the National Historic Preservation Act of 1966, as amended. By letter dated April 2, 1999, the SHPO concurred with the Corps' findings that there would be no historic properties affected by the project (Appendix E).

Should any archeological resources be discovered during project construction, work would stop in that area until the find is evaluated by a professional archeologist and Section 106 consultation with the SHPO and any other interested parties is concluded. Should the find be determined significant, mitigation could consist of avoidance of further effect to the resource or data recovery.

CHAPTER 5.0

OTHER REQUIRED CONSIDERATIONS

This chapter describes other requirements not discussed elsewhere in the EIS/EIR. These include cumulative, growth-inducing, and unavoidable adverse effects; the relationship of short-term uses and long-term productivity; irreversible and irretrievable commitments of resources; and compliance with applicable laws, policies, and plans. Also included are sections describing mitigation and environmental monitoring of the project; the project's compliance with applicable laws, policies, and plans; and public involvement activities.

5.1 CUMULATIVE EFFECTS

5.1.1 Introduction

National Environmental Policy Act (NEPA) regulations and CEQA Guidelines require that an EIS/EIR discuss project effects that, when combined with the effects of other projects, result in significant cumulative effects. NEPA regulations define a cumulative effect as: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collective significant actions take over a period of time (40 CFR 1508.7)."

CEQA Guidelines require that an EIR discuss cumulative effects "when the incremental effect is cumulatively considerable" (Section 15130). The guidelines define a cumulative effect as "an impact which is created as a result of the combination of the project evaluation in the EIR together with other projects causing related impacts" (Section 15355). In addition, they state: "The cumulative impact of several projects is [defined as] the change in the environmental which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable future projects (Section 15355)."

The discussion of cumulative effects must reflect the severity of the effects and their likelihood of occurrence; however, the discussion need not evaluate cumulative effects to the degree of specificity required for project-specific effect analysis. CEQA Guidelines state that the discussion of cumulative effects should ultimately be guided by the standards of practicality and reasonableness (Section 15130).

The following discussion identifies other projects in the study area and evaluates the potential cumulative effects of the alternatives in relation to these projects.

5.1.2 Related Projects in the Study Area

Various past, present, and reasonably foreseeable future projects in the study area could act together with the project alternatives to have cumulative effects on the resources in the area. The major past projects include construction of the Pine Flat Dam, Army Weir, Friant-Kern Canal, California Aqueduct, and the Pine Flat Power Plant. These projects help regulate flows by controlling releases to reduce flood damages and to provide water and hydroelectric power for urban, agricultural, and environmental use. Ongoing projects include activities under the Kings River Fisheries Management Program as described in Section 2.2.1. Future projects include construction of a turbine bypass facility as proposed in the "Pine Flat Dam Turbine Bypass, California, Habitat Restoration, Project Modification Report and Environmental Assessment," September 1996, and possible restoration work by the U.S. Bureau of Reclamation.

These projects include mitigation measures to reduce any potential adverse environmental effects to below the level of significance. Projects which would have a beneficial cumulative effect on fish resources include the Kings River Fisheries Management Program and Pine Flat Turbine Bypass Habitat Restoration Project.

Pine Flat Dam and Powerplant

The Pine Flat Project was constructed by the Corps and completed in 1954 for flood control and water conservation. Penstocks for hydropower were included in the construction of the dam. In addition to the dam, the project included downstream improvements to control flooding and diversion of flows between the Kings River North and Kings River South. The downstream improvements were completed in 1976. Pine Flat Dam is a concrete-gravity structure that is 429 feet high and 1,820 feet long at the crest. The dam has a storage capacity of about 1 million acre-feet, all of which is available for flood control when required.

The Pine Flat Project provides flood protection to about 80,000 acres of agricultural land along the Kings River and, in conjunction with other projects on the Kaweah, Tule, and Kern Rivers, to 260,000 acres of agricultural land in the Tulare Lakebed. Recreation is an incidental benefit of the project. KRCD added the hydropower plant to the Pine Flat Project in 1984 (Corps, 1994a).

Army Weir

Army Weir is a diversion structure completed by the Corps in 1943 to regulate flows between the Kings River North and Kings River South. The KRWA operates the weir in accordance with agreements among the various

members of the association. The Corps maintains the weir and directs its operation during floods.

Friant-Kern Canal

The Friant-Kern Canal is operated by the U.S. Bureau of Reclamation as part of the Federal Central Valley Project. The canal extends from Friant Dam on the San Joaquin River south to Kern County and provides irrigation water to users along the lower east side of the San Joaquin Valley. The canal crosses the Kings River upstream from Centerville Bottoms.

California Aqueduct

The California Aqueduct carries water from the Sacramento-San Joaquin Delta to the San Joaquin Valley. The aqueduct carries agricultural, municipal, and industrial water. It is the principal conveyance feature of the State Water Project. The aqueduct passes along the western edge of the Tulare Lake Basin and provides water to the Tulare Lake Basin Water Storage District and Empire West Side Irrigation District (both units of KRWA).

Kings River Fisheries Management Program

Beginning in 1994, a voluntary effort was undertaken to establish a fisheries management program for the Kings River. The need for such a voluntary program was to balance the fishery needs with other beneficial uses of the Kings River while maintaining established water and storage rights. Participants in the program included the DFG, KRCD, and KRWA. On May 28, 1999, a Kings River Fisheries Management Program Framework Agreement was signed, which established a number of aquatic resource enhancement goals for the lower Kings River and Pine Flat Lake.

These goals include enhancing fishery habitat in Pine Flat Lake and the river downstream while balancing the beneficial uses of the Kings River. The adaptive management program includes several actions: establishing a 100,000 acre-foot temperature control pool within the reservoir, establishing a minimum river flow of 95 cfs to Fresno Weir, providing annual funding, trout stocking and habitat improvement, public education and involvement, public access improvements, program monitoring, and regulating fishing along the lower Kings River.

Under the fisheries management program, enhanced minimum flows were established in the Kings River in its 10-mile reach between Pine Flat Dam and the Fresno Weir. These flows were in addition to those provided by a 1964 agreement between the KRWA and DFG. Voluntary flows of at least 95 cfs to Fresno Weir and 5 cfs to Dennis Cut Weir were provided by member water rights units of the KRWA. In addition to the enhanced minimum flows in the river and

creation of the temperature control pool, the fisheries management program constructed the Kings River's first artificial trout spawning and rearing channel in the spring of 2000. The channel, which is located 5 miles downstream of Pine Flat Dam, is about 2,000 feet long. The channel was named the Thorburn Spawning Gravel Project in honor of the landowners who granted an easement for the project. In addition, several large boulders have been placed in the Kings River adjacent to the restoration site. These boulders create hiding cover for coldwater fish.

The DFG, KRCD, and KRWA are continuing to study, and intend to implement, additional components of the fisheries management program, including additional spawning gravel and rearing channels and habitat restoration projects, as well as fish stocking, enforcement, public information and education, stream monitoring, and program funding. An important component of this management program is to maintain support for the Corps' efforts and studies involving potential projects for fish and wildlife restoration on the Kings River.

Pine Flat Turbine Bypass

The Pine Flat Turbine Bypass Project is one element of an overall fishery improvement plan for the lower Kings River. The construction of a turbine bypass at Pine Flat Dam was authorized under the authority of Section 1135 in 1999. Currently, plans and specifications are being finalized for the turbine bypass. The turbine bypass is an important element in the overall management plan to support a sustainable coldwater fishery in the lower Kings River below Pine Flat Dam. It is important because of the flexibility it provides to manage the coldwater reserves when the turbines are not operating. As part of the overall plan, the turbine bypass will complement and cumulatively improve the benefits of the 100,000 acre-foot temperature control pool and multilevel intake structure.

Restoration of Bureau Property

The U.S. Bureau of Reclamation owns about 120 acres north and 700 acres east of the Byrd Slough restoration site. The Bureau plans to restore riparian values on the two parcels, including riparian forest and shrub, SRA, emergent marsh, and threatened and endangered species habitats. Development of the Bureau's two parcels along with the Byrd Slough restoration site would provide a large contiguous parcel of land, which could provide optimal riparian and SRA habitat values to wildlife populations for feeding and breeding.

5.1.3 Evaluation of Cumulative Effects

Past water resource management projects in the study area have resulted in adverse cumulative effects on fish and wildlife resources in the Kings River Basin and San Joaquin Valley. Less than 10 percent of California's riparian, SRA, and native oak woodland habitat remains in the State. Available data

suggest that continued degradation and loss of riparian, SRA, oak woodland, associated wildlife, and aquatic resources in the region could result from additional water management projects. However, ongoing and future water resource management projects are expected to include mitigation measures to reduce project effects to a less-than-significant level.

The Pine Flat Dam ecosystem restoration project is not expected to result in any significant adverse effects on environmental resources. The project would include mitigation measures to avoid or reduce any adverse effects. In fact, the project would have beneficial cumulative effects on fish and wildlife habitat. The following three areas were evaluated:

Pine Flat Reservoir

The alternatives would have no significant adverse cumulative effects on vegetation and wildlife, fisheries, special status species, water quality, air quality, land use, prime and unique farmland, or cultural resources. The installation of a multilevel intake structure on Pine Flat Dam would result in increased flexibility in managing water release temperatures for the coldwater fishery. The project would have beneficial cumulative effects on fish and wildlife habitat.

Lower Kings River

The alternatives would have no significant adverse cumulative effects on vegetation and wildlife, fisheries, special status species, water quality, air quality, land use, prime and unique farmland, and cultural resources. The project would have beneficial cumulative effects on fish, wildlife, riparian, SRA, and oak woodland habitats.

Byrd Slough Habitat Restoration Site

The alternatives would have no significant adverse cumulative effects on vegetation and wildlife, fisheries, special status species, water quality, air quality, land use, prime and unique farmland, and cultural resources. The restoration of riparian scrub, riparian forest, SRA, oak savannah, and oak woodland vegetation in this area is significant in the context of the greater San Joaquin Valley. Less than 10 percent of California's riparian, SRA, and native oak woodland habitat remains so any improvements to the remaining fragments of these habitats are significant. The project would have beneficial cumulative effects on riparian, SRA, and oak woodland habitats and associated fish and wildlife.

5.2 GROWTH-INDUCING EFFECTS

CEQA specifically requires that growth-inducing effects be addressed in EIR's (Section 15126.2[d]). According to the CEQA Guidelines, a growth-inducing effect is one that could foster economic or population growth, or directly

or indirectly bring about construction of additional housing in the surrounding environment (Section 15126[g]).

5.2.1 No Action

Approved development in the project area would continue; development has been based on the assumption that Pine Flat Dam and associated levee systems provide the previously authorized design level of flood protection.

5.2.2 Multilevel Intake Structure

Construction of the multilevel intake structure would not increase the level of flood protection that the dam and levees were originally authorized by Congress to provide. Therefore, the multilevel intake structure would not induce growth of the area. Land use decisions in the project area have been made based on the assumptions that the authorized level of flood protection was being provided by the system.

5.2.3 Byrd Slough Habitat Restoration

Construction of the Byrd Slough habitat restoration would not increase the level of flood protection that the dam and levees were originally authorized by Congress to provide. Therefore, the Byrd Slough habitat restoration would not induce growth of the area. Land use decisions in the project area have been made based on the assumptions that the authorized level of flood protection was being provided by the system.

5.3 SIGNIFICANT AND UNAVOIDABLE EFFECTS

The CEQA Guidelines state that any significant environmental effects which cannot be avoided if the proposal is implemented must be described. This description extends to those significant effects which can be mitigated but not reduced to a level of insignificance. For example, damage to critical habitat and incidental take of sensitive species would be a significant and unavoidable effect. None of the alternatives would have significant and unavoidable effects.

5.4 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE OF LONG-TERM PRODUCTIVITY

In accordance with CEQA sections 21083 and 21087, this EIS/EIR discusses the cumulative and long-term effects of proposed project alternatives that have potential to adversely affect the state of the environment. The discussion of effects should include effects which narrow the range of beneficial uses of the environment or pose long-term risks to health and safety.

The multilevel intake structure would provide increased flexibility in managing water release temperatures during critical months to benefit fish habitat. The water releases would not be permanently affected, and the beneficial use of the environment for flood control, water supply, and power generation would not change. The multilevel intake structure provides an opportunity to alter the short-term uses of the environment to maintain the long-term productivity of fish resources. The areas that would be affected by the construction alternatives would undergo long-term changes in their environmental uses to improve fish and wildlife habitat. These changes would not be associated with providing additional flood control and water supply, but would be associated with selective withdrawals from Pine Flat Lake during critical periods to improve fish habitat. There would be no adverse effects that pose a long-term risk to health and safety.

5.5 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES ASSOCIATED WITH THE PROJECT

In accordance with CEQA sections 21083 and 21087, this EIS/EIR discusses any irreversible and irretrievable commitment of resources which would be involved in constructing the project. Significant irreversible environmental changes are defined as uses of nonrenewable resources which may be irreversible since a large commitment of these resources makes future removal or nonuse unlikely.

Construction activities would involve the consumption of nonrenewable natural resources such as structural steel for the multilevel intake structure, and petroleum as fuel. The resources used in site preparation, material transportation, excavation, and disposal of excess materials for construction of the multilevel intake structure and Byrd Slough habitat restoration would be permanently committed to the project alternatives. In addition, the non-Federal sponsor would use petroleum for fuel in the continued operation and maintenance of the completed project including the Byrd Slough restoration site. However, since the consumption or use of nonrenewable resources is relatively low for the project alternative, no significant adverse effects are expected.

5.6 MITIGATION AND ENVIRONMENTAL MONITORING

This section discusses the mechanisms needed to ensure that the mitigation measures identified in Chapter 4 would be accomplished. These measures consist of actions required to minimize unavoidable effects of the proposed project. The mitigation for this project would be an authorized project feature and would be cost shared by the Federal Government and non-Federal sponsor. In accordance with Section 906 of the Water Resources Development Act of 1986, mitigation for direct project effects would be accomplished prior to or concurrent with construction. Mitigation measures are summarized in Chapter 2 and are presented in detail in Chapter 4.

Project effects associated with construction such as temporary minor effects to traffic, noise, air quality, and water quality would be mitigated by best management practices implemented during construction. No long-term monitoring is needed for best management practices, which are detailed in Chapter 4. The SHPO has confirmed the Corps' finding that no mitigation is needed for cultural resources. There are no known HTRW sites in the project area. If HTRW is discovered during construction, it must be remediated to meet the requirements of the U.S. EPA and applicable State regulatory agencies. The non-Federal sponsor is responsible for ensuring that the development and execution of HTRW actions are accomplished at 100 percent non-project cost.

The Corps and the non-Federal sponsor would be jointly responsible for ensuring the implementation and success of the mitigation and monitoring requirements. The environmental commitments to mitigate and monitor for the direct effects of the project alternatives are listed below.

Noise

During project construction, noise-generating equipment would be limited to work during daytime hours only. Additionally, all mobile equipment would be fitted with mufflers consistent with the best noise reduction technology.

Traffic

Construction and restoration activities would not close or block a roadway or block emergency vehicle access. Precautions such as posted construction zones, reduced speed limits, flagmen, off-street parking, and construction quality control monitors would be taken to ensure public safety on the roadways. Any damage to roadway surfaces from the operation of heavy equipment would be repaired.

Special Status Species

Pre-construction surveys would be conducted to avoid listed sensitive species or critical habitats. If any special status species are found, a plan for avoidance would be developed with the FWS and DFG. A qualified biologist would monitor the project area to ensure avoidance of special status species during construction and restoration activities.

Water Quality

Best management practices would be implemented to protect water quality for the project alternatives. A water quality monitoring program would be implemented by the construction contractor and non-Federal sponsor during construction. Best management practices would consist of regular watering of

construction surfaces with water trucks to prevent wind erosion of dust into water resources, temporary berms to prevent materials from eroding in or near water resources, refueling equipment in designated areas, monitoring and maintaining equipment for fuel leaks regularly, and reseeding soil areas with native grass to prevent soil erosion from surface water runoff. A water quality monitoring program which consists of water testing and laboratory analysis would be conducted by the construction contractor and KRCD to alert construction representatives if levels of pollutants have increased above standards set by the U.S. EPA and Regional Water Quality Control Board.

Air Quality

- During project construction, the specific best management practices listed in Section 4.5.5 for combustion emissions and PM_{10} emissions would be implemented to reduce any emissions to less than significant. All standard practices and procedures set by the SJAPCD, the Air Resources Board, and the guidelines provided by the U.S. EPA to minimize emissions would be employed during construction.

- Construction contracts would be scheduled by the Corps so as not to exceed daily (lbs/day) local and State air quality thresholds in Fresno County for NO_x, CO, and PM_{10}.

- To decrease the amount of dust and PM_{10}, unpaved haul roads, staging areas, and stockpile areas would be watered to keep them moist.

5.7 FISH AND WILDLIFE RECOMMENDATIONS

The FWS submitted a draft CAR for the Pine Flat Dam Fish and Wildlife Habitat Restoration, Fresno, California, project in January 2000. The recommendations from that CAR are presented below, and Corps responses to the general recommendations follow each recommendation.

The FWS recommends that the Corps:

- Select the maximum alternative for the terrestrial restoration and, if constructed, the combination alternative (both water transfer plan and multi-level intake structure) for the aquatic restoration.

Based on the incremental analysis in Appendix D of the main feasibility report, the combined restoration plan includes the maximum design for the restoration of the Byrd Slough site and construction of the multilevel intake structure. Preliminary economic and benefit analyses of the water transfer plan indicated that the estimated first cost for construction of the water transfer pipeline was at least $30 million with relatively limited aquatic and terrestrial benefits. In addition, there was the

potential for significant adverse effects on vernal pool/alkali scald habitat and special-status species along the pipeline. Due to these high construction costs, limited benefits, and potential adverse environmental effects, the Corps and non-Federal sponsor agreed that the water transfer alternative should not be considered further.

- If implemented, monitor the terrestrial restoration site for a period of 20 years, consisting of plant survival and cover, and wildlife use. Monitoring and reporting should be done annually for the first five years and every fifth year thereafter.

The Byrd Slough habitat restoration alternative consists of a 3-year establishment period (including monitoring) conducted by the Corps, and long-term maintenance by the non-Federal sponsor for as long as the project remains authorized. The Corps responsibility with regard to the site will be the initial establishment of all restoration features, including plantings, irrigation features, fencing, signage, habitat structures, etc. Once a functional portion of the project is complete, that portion of the project will be turned over to the sponsor for OMRR&R. The Corps would continue to be responsible for the establishment of the plantings, irrigation and other directly associated features for the remainder of the 3-year establishment period. After the 3-year establishment period has ended, the Corps will then transfer OMRR&R responsibilities for the plantings to the sponsor.

- Investigate alternatives to further enhance the rainbow trout fishery in the lower Kings River, including addition of spawning gravels and retention structures, provision of passage and screening at major diversions, and enhancement of riparian cover at the stream edge.

The Kings River Fishery Management Program includes many activities that will further enhance the rainbow trout fishery in the Kings River.

- Complete any consultation requirements with the FWS pursuant to Section 7 of the Endangered Species Act.

A biological assessment was submitted to FWS on September 18, 2000, and a supplemental biological assessment was submitted to FWS in November 2001. Coordination will be completed with a final CAR anticipated by December 2001.

- Contact DFG to determine potential project effects to State endangered and/or threatened species.

The draft EIS/EIR has been distributed for review to DFG, and no comments were received. Coordination with DFG has been conducted in the past, and any measures necessary to minimize the potential for adverse effects to listed species will be implemented, as necessary.

5.8 PUBLIC INVOLVEMENT

5.8.1 Scoping and Comments

Throughout the study, the Corps has coordinated closely with the non-Federal cost-sharing sponsor, the KRCD. During the reconnaissance phase of study, a multi-disciplinary study management team was formed, which consisted of experts in various fields both within and outside the Corps, representatives from the cost-sharing partners, contractors, and other agencies and local interests. Early on, the Corps met individually with many separate interest groups including DFG, Reclamation, KRCD, KRWA, FID, Fly Fishers for Conservation, Kings River Expeditions, and Pine Flat Advisory Council. In addition, an Executive Committee consisting of responsible officers from the cost-sharing partners, was consulted on major management decisions in accordance with the agreement in the Feasibility Cost Sharing Agreement. Informational meetings were mostly informal and were designed to inform the study participants of the progress of the study.

The Corps is conducting this study with the assistance and cooperation of the KRCD, the non-Federal sponsor, and the KRWA, an equal cost-sharing partner with KRCD in this study. The KRCD was formed as a public agency in 1951 and acts on behalf of the Kings River Service Area and its landowners on a variety of river issues and potential projects. The agency also operates and maintains the downstream levee and channel system, which is part of the Pine Flat project, and owns and operates the Pine Flat Power Plant. The KRWA was formed in 1927 to administer Kings River water rights and entitlements along with water deliveries in accordance with diversion schedules. Irrigation water is delivered to 28 member agencies in the Kings River Service Area, which encompasses about 1.1 million acres.

The Notice of Initiation of Reconnaissance Study with an announcement of a public workshop was sent out in April 1993. The workshop was held May 13, 1993. Following the workshop, an ad hoc committee was established, composed of representatives from the Corps, DFG, Reclamation, KRCD, KRWA, FID, Clovis Bass Club, Fly Fishers for Conservation, Lower Kings River Committee, landowners around the lake and marina, and whitewater rafting representatives. Members of the ad hoc committee participated in identifying problems and considering measures. Meeting dates of the committee were June 17, 1993, July 15, 1993, September 23, 1993, October 21, 1993, January 20, 1994, and March 17, 1994. During the process, team members made site visits to verify the extent of the problems, consider potential solutions, and identify

potential restoration sites. Information and comments received through the public coordination process were incorporated into the Pine Flat Dam Fish and Wildlife Habitat Restoration Investigation, California, Reconnaissance Report, April 1994 (Corps, 1994).

The feasibility study was initiated after execution of the Feasibility Cost-Sharing Agreement between the Corps and KRCD in January 1996. A notice of initiation of the feasibility study was circulated in late March 1996, and a notice of intent to prepare a draft EIS/EIR for the Pine Flat restoration study was published in the Federal Register. This notice provided information on the study and encouraged nationwide comment. A public scoping meeting was held in Fresno on April 24, 1996. At the meeting, the public was provided with information on the environmental problems in the Kings River basin, ecosystem restoration alternatives, and study process. A study management team composed of Corps and KRCD representatives was formed to manage the technical studies and participate in the evaluation of the alternative plans.

The notice of availability for the draft EIS/EIR was published in the Federal Register in July 2001. The draft EIS/EIR was distributed for agency and public review and comment in July 2001. Opportunities to provide comments included include via mail, email, telephone, and fax. Both verbal and written comments were accepted. All comments received by September 20, 2001, were considered and incorporated into the final EIS/EIR, as appropriate. In addition, comments and responses are included in an Appendix F to the final EIS/EIR.

5.8.2 Intended Uses of the EIS/EIR

The final EIS/EIR has been prepared to satisfy both Federal and State environmental reporting requirements, pursuant to Section 40 CFR 1506.2(b) of NEQA implementation regulations and Section 21083.5 of CEQA. The purpose of the final EIS/EIR is to inform public agency decisionmakers and the general public of the significant effects of the project. The document also identifies ways to minimize significant adverse effects and describes any reasonable alternatives to the project (CEQA Guidelines, Section 15121(a) and NEPA Regulations, Section 1502.1).

The final EIS/EIR will be submitted first to the Secretary of the Army, who issues a Record of Decision regarding the adequacy of the document and the desirability of going forward with the project. If the Secretary reaches a decision in favor of construction, the EIS/EIR goes to Congress, who then decides whether or not to authorize the project.

On the local level, the document must be approved by the KRCD, which functions as a "lead agency" (CEQA Guidelines, Section 15381) and which represents the local interests. State and other local agencies may use the final EIS/EIR when they consider permits or approvals that may be associated with

the project. The non-Federal sponsor would coordinate an approval with Fresno County to acquire the Byrd Slough restoration site.

5.8.3 Distribution List

This section provides a partial list of Federal, State, regional, and local public and private agencies and organizations to whom a copy of the final EIS/EIR will be distributed. In addition to the regulatory agencies, agencies with special expertise or interest in evaluating the environmental issues related to the project are included. Private agencies, organizations, and individuals who may be affected by the project or who have commented on the draft EIS/EIR are also included.

ELECTED OFFICIAL AND REPRESENTATIVES

Governor of California
- Honorable Gray Davis

United States Senate
- Honorable Barbara Boxer
- Honorable Dianne Feinstein

House of Representatives
- Honorable Calvin Dooley
- Honorable George P. Radanovich

California Senate
- Honorable Jim Costa
- Honorable Charles Poochigian

California Assembly
- Honorable Sarah Reyes
- Honorable Dean Flores
- Honorable Mike Briggs

UNITED STATES GOVERNMENT DEPARTMENTS AND AGENCIES

Department of Energy
- Federal Energy Regulatory Commission
- Division of NEPA Affairs

Department of the Interior
- Bureau of Indian Affairs
- Fish and Wildlife Service, Division of Ecological Services
- Fish and Wildlife Service, Endangered Species
- Geological Survey
- Office of Environmental Project Review
- Bureau of Reclamation
- Bureau of Land Management
- Sequoia and Kings Canyon National Parks

Advisory Council of Historic Preservation

Department of Agriculture
- Natural Resources Conservation Service
- Agriculture Stabilization and Conservation Service
- Forest Service

Department of Labor
- Manpower Administration

Department of Transportation
- Federal Highway Administration

Council on Environmental Quality
Environmental Protection Agency
Federal Emergency Management Agency

STATE OF CALIFORNIA GOVERNMENT AGENCIES

State of California
- Office of Historic Preservation
- Office of Attorney General
- Department of Justice
- Environmental Protection Agency

Senate Committee on Natural Resources
Assembly Committee on Water, Parks and Wildlife
Governor's Office of Planning and Research
- State Clearinghouse

The Resources Agency
- Department of Fish and Game
- Department of Conservation
- Department of Boating and Waterways
- Department of Forestry and Fire Protection
- Department of Water Resources
  - The Reclamation Board
  - California Water Commission
- State Water Resources Control Board
  - Regional Water Quality Control Board
- State Lands Commission

LOCAL GOVERNMENT

Fresno County Board of Supervisors
Fresno City Council
Fresno City and County Chamber of Commerce
Fresno Metropolitan Flood Control District
Fresno County Public Works Department
Fresno County Planning and Resource Management Department
Fresno County Water Advisory Committee
Fresno County Library
Irrigation and Water Districts

Fresno County Department of General Services, Parks Services

ORGANIZATIONS

American Whitewater
Audubon Society
California Native Plant Society
California Wildlife Federation
Fresno County Farm Bureau
Local Marinas
Local Fishing Groups/Clubs
Natural Resources Defense Council
Sierra Club
The Nature Conservancy
Trout Unlimited

5.9 COMPLIANCE WITH APPLICABLE LAWS, POLICIES, AND PLANS

The relationship of the alternatives to applicable Federal and State environmental requirements is summarized below. The project will be in compliance with all laws, regulations, and Executive Orders.

5.9.1 Federal Statutes and Policies

Clean Air Act, as amended. Compliance: Full. Implementing the Recommended Plan would require the use of construction equipment. The air quality effects of each alternative have been evaluated and determined to be below the *de minimis* threshold with appropriate mitigation. The results of this analysis were coordinated with the SJAQMD.

Clean Water Act, as amended. Compliance: Full. The potential effects of each alternative on water quality have been evaluated and are discussed in Section 4.4. A Section 404(b)(1) evaluation is not required for the proposed ecosystem restoration work. Nationwide Permit Number 27 authorizes activities in waters of the U.S. associated with the restoration of altered and degraded non-tidal wetlands and creation of wetlands on private lands. Nationwide Permit Number 7 authorizes the placement of inlet and outlet structures for water conveyance from waters of the U.S.

Endangered Species Act of 1973, as amended. Compliance: Partial. Section 7 of the Endangered Species Act requires Federal agencies, in consultation with the Secretary of the Interior, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat for these species. The BDR has been prepared and is included in Appendix C. Based on the results of the BDR, the Corps has prepared the Biological Assessment (BA)

of the effects of the project on special status species. This BA has been forwarded to FWS for their review, and concurrence of a determination of not likely to significantly affect any Federally listed species is anticipated not later than December 2001.

Farmland Protection Policy Act. Compliance: Full. This act requires a Federal agency to consider the effects of its action and programs on the Nation's farmland. The Corps provided the NRCS with maps and descriptions to assess effects on prime and unique farmlands on December 8, 1999. The NRCS completed their analysis on January 18, 2000, and provided the Corps with a Farmland Conversion Impact Rating letter that indicates that no prime and unique farmlands would be adversely affected by the proposed project (Appendix D).

Fish and Wildlife Coordination Act, as amended. Compliance: Partial. The Corps is consulting with the FWS as directed under this act in order to conserve wildlife resources. This consultation is intended to promote the conservation of wildlife resources by preventing loss or damage to fish and wildlife resources and to provide for the development and improvement of fish and wildlife resources in connection with water projects. The FWS is authorized to conduct necessary surveys and investigations to determine the possible damage to resources and to determine measures to prevent such losses. The FWS prepared the draft CAR (Appendix A). The CAR addresses the effects of the proposed project. The FWS recommendations are addressed in Section 5.7. A final CAR is anticipated no later than December 2001.

National Historic Preservation Act of 1966, as amended, Historic and Archeological Resources Protection Act, Protection of Historic Properties, Abandoned Shipwreck Act. Compliance: Full. These acts and regulations require Federal agencies to take into account the effects of Federal undertakings on historical and archeological resources. Under these requirements, the area of potential effect of the selected project shall be inventoried and evaluated to identify historical of archeological properties that have been placed on the National Register of Historic Places and those that the agency and the SHPO agree are eligible for listing in the National Register. If the project is determined to have an effect on such properties, the agency must consult with the SHPO and the Advisory Council on Historic Preservation to develop alternative or mitigation measures. The Corps has evaluated Pine Flat Dam and has conducted archeological surveys of the Byrd Slough restoration area. A letter to the SHPO was sent on March 18, 1999, stating that there would be no effect to properties eligible for, or listed in, the National Register of Historic Places. A response letter from the SHPO was received by the Corps on April 2, 1999, confirming there were no known historic properties that may be affected by the proposed ecosystem restoration.

National Environmental Policy Act of 1969. Compliance: Partial. NEPA states that the Federal Government shall include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official. The final EIS constitutes partial compliance with NEPA. Full compliance will be achieved when the final EIS and record of decision are filed with the Environmental Protection Agency.

Wild and Scenic Rivers Act. Compliance: Full. The proposed project would not affect any river segment designated as wild and scenic. The Kings River upstream of Pine Flat Dam is designated as wild and scenic; however, the proposed project would not affect this reach.

Federal Water Project Recreation Act of 1965. Compliance: Full. This act requires that in planning any Federal navigation, flood control, or multipurpose project, full consideration be given to the opportunities afforded by the project for outdoor recreation and fish and wildlife enhancement. The purpose of the proposed work is restoration of fish and wildlife resources. Improving fish habitat on the lower Kings River would also provide additional recreational opportunities. Recreational resources are addressed in section 3.2.5.

Executive Order 11988, Floodplain Management. Compliance: Full. The objective of this executive order is the avoidance, to the extent possible, of long- and short-term adverse effects associated with the occupancy and modification of the base flood plain and the avoidance of direct and indirect support of development in the base flood plain wherever there is a practicable alternative. The proposed project is consistent with the objective of this executive order. The proposed work would restore and preserve the natural and beneficial values of the base flood plain.

Executive Order 11990, Protection of Wetlands. Compliance: Full. The objective of this executive order is to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. The proposed project is consistent with the objective of this executive order. The proposed work would restore and preserve the natural and beneficial values of wetlands.

Executive Order 12989, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Compliance: Full. This Executive Order states that Federal agencies are responsible to conduct their programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination under,

such programs, policies, and activities, because of their race, color, or national origin.

The project was formulated in full compliance with this executive order. The benefits of ecosystem restoration in the Kings River watershed would extend to all residents of Fresno County. Full public participation was encouraged through a public scoping notice and a public workshop.

5.9.2 State Statutes and Policies

California Environmental Quality Act. Compliance: Full. The document has been adopted as a joint EIS/EIR and fully complies with CEQA.

California Endangered Species Act. Compliance: Full. The DFG administers this act, which requires the non-Federal lead agency to prepare biological assessments if a project may adversely affect one or more State-listed threatened or endangered species. The BDR addressing both Federally and State-listed species has been prepared and is included in Appendix C. The non-Federal lead agency, KRCD, has reviewed this BDR and decided that consultation with DFG regarding State-listed species is not necessary at this time.

Department of Water Resources, Division of Safety of Dams. Compliance: Not Applicable. DWR is the responsible agency for ensuring the safety of non-Federal dams and reservoirs. The DWR's dam safety division approves plans and specifications to construct dams and reservoirs after completion of the appropriate environmental documentation and review process. The Division of Safety of Dams issues a Certificate of Approval for any dam construction or enlargement plans after a determination that the selected project could safely impound water. Since Pine Flat is a Federal dam, it is not within the State's jurisdiction and would not require a Certificate of Approval from the Division prior to construction.

State Water Resources Control Board, Division of Water Quality, and the California Regional Water Quality Control Board. Compliance: Full. The State Water Resources Control Board and the California Regional Water Quality Control Board review activities that affect water quality in the Central Valley. The Boards administer the requirements mandated by State and Federal law (Clean Water Act). The Regional Water Quality Control Board establishes water quality standards and reviews individual projects for compliance with the standards. Section 404 and 401(b)(1) permits for the project would not be required because the project does not include dredging or filling waters of the United States. None of the project activities would adversely affect water quality.

State Water Resources Control Board, Division of Water Rights. Compliance: Full. This agency issues permits for the appropriation of water resulting from storage or diversion. The appropriation must be related to a beneficial use. Currently, all water from the Kings River is fully appropriated. Because no new water is being developed by the project, no new permits for the appropriation of water would be needed.

State Historic Preservation Office. Compliance: Full. If the project is determined to have an effect on historical or archeological properties that have been placed on the National Register of Historic Places or those properties that the agency and the SHPO agree are eligible for listing in the National Register, then the Corps must consult with the SHPO and the Advisory Council on Historic Preservation to develop alternatives or mitigation measures. A survey has been conducted prior to initiation of construction.

State Lands Commission. Compliance: Not Applicable. The State Lands Commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the State and the bed of navigable rivers, sloughs, and lakes (Public Resources Code, Section 6301). State ownership extends to lands lying below the ordinary high-water mark of tidal waterways and below the low-water mark of nontidal waterways (Civil Code, Section 830). The area between ordinary high and low water on nontidal waterways is subject to a public trust easement. A project cannot use these State lands unless a lease is first obtained from the State Lands Commission. The proposed project would not use any such lands.

5.9.3 Local Statutes and Policies

Air Pollution Control District. Compliance: Full. The project falls under the jurisdiction of the SJAQMD. The SJAQMD determines whether project emission sources and levels significantly affect air quality, based on Federal Standards established by the U.S. EPA, and the California Air Resources Board.

CHAPTER 6.0

LIST OF PREPARERS

Name/Expertise	Experience	Role In Preparation
Brian Cordone Biologist	5 years biological analysis, U.S. Fish and Wildlife Service	Draft Coordination Act Report
Irene Davies Senior Planner	11 years environmental planning, Corps of Engineers 7 years mechanical engineering	Alternative formulation
Jerry Fuentes Historian/Social Sciences	10 years environmental planning, Corps of Engineers	Report review
Deborah Giglio Biological Sciences	8.5 years environmental planning, Corps of Engineers; 1 year biologist, Agricultural Research Service environmental manager	Draft Report preparation and coordination
Patti Johnson archeologist Corps of Engineers	25 years cultural resources management,	Historical and cultural resources
Kings River Conservation District Fresno, California	80 years combined experience involving water resource management and engineering, and planning and environmental analysis	Report review
Lynne Stevenson Environmental Writer	16 years planning and engineering studies, Corps of Engineers	Report organization and review
David Tedrick Biological Sciences	8 years environmental compliance and regulation; 1 year environmental planning, Corps of Engineers	Report organization and review

CHAPTER 7.0

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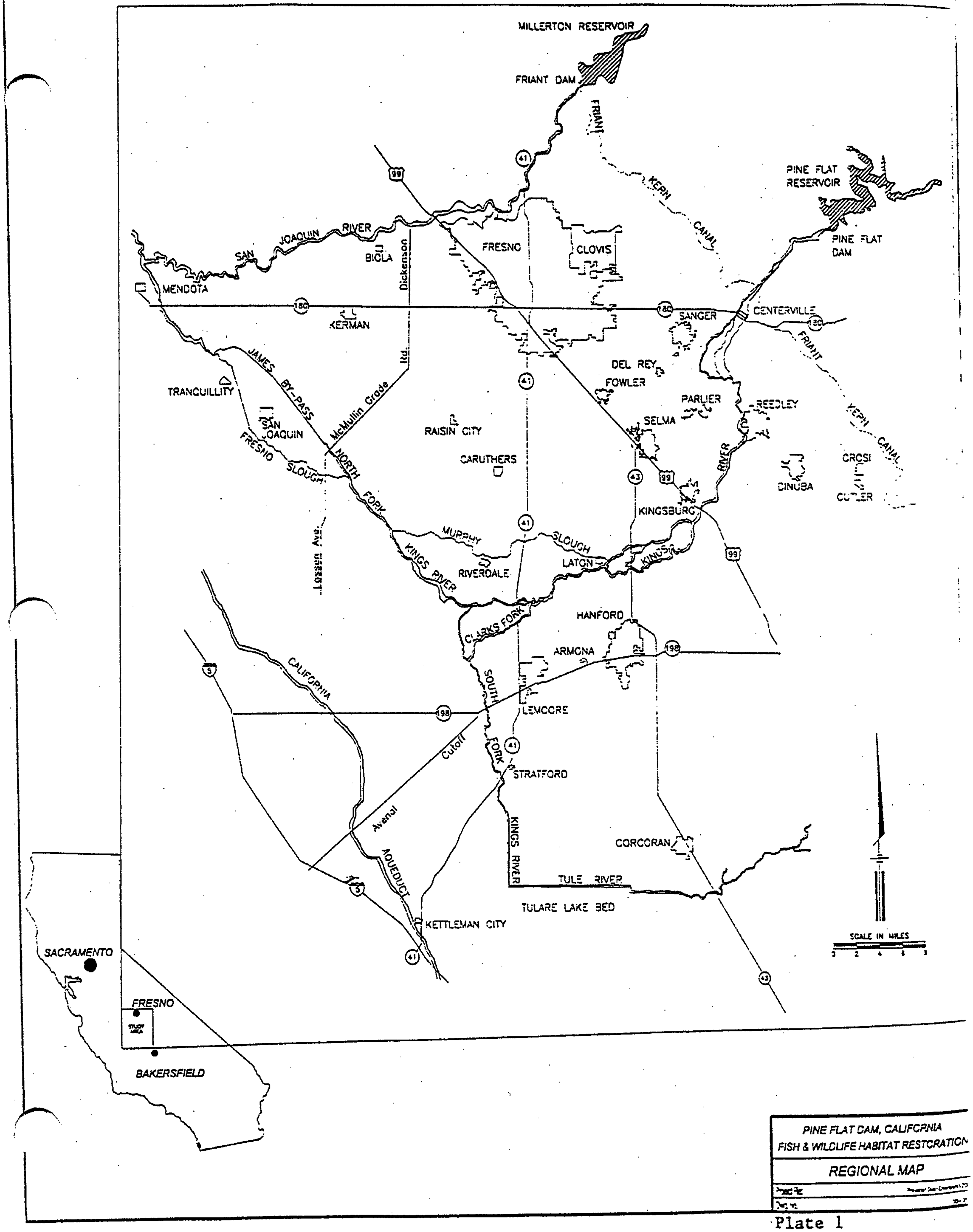
CHAPTER 8.0

INDEX

PLATES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CANAL
PINE FLAT RESERVOIR
PINE FLAT DAM
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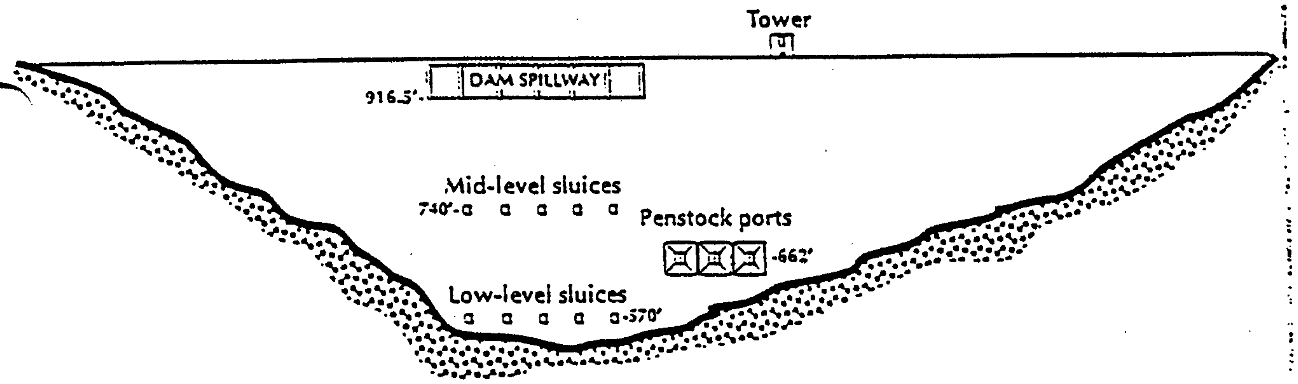
MENDOTA
Dickenson Rd.
KERMAN
SANGER
CENTERVILLE
FRIANT KERN CANAL
JAMES BY-PASS
McMullin Grade
TRANQUILLITY
DEL REY
FOWLER
PARLIER
REEDLEY
SAN JOAQUIN
RAISIN CITY
SELMA
FRESNO SLOUGH
NORTH FORK
CARUTHERS
OROSI
CUTLER
DINUBA
RIVER
KINGSBURG
Lassen Ave.
MURPHY SLOUGH
KINGS RIVER
RIVERDALE
LATON
KINGS
HANFORD
CLARKS FORK
ARMONA
CALIFORNIA
SOUTH FORK
LEMOORE
Avenal Cutoff
STRATFORD
AQUEDUCT
KINGS RIVER
CORCORAN
TULE RIVER
TULARE LAKE BED
KETTLEMAN CITY
SCALE IN MILES
SACRAMENTO
FRESNO
STUDY AREA
BAKERSFIELD
PINE FLAT DAM, CALIFORNIA
FISH & WILDLIFE HABITAT RESTORATION
REGIONAL MAP

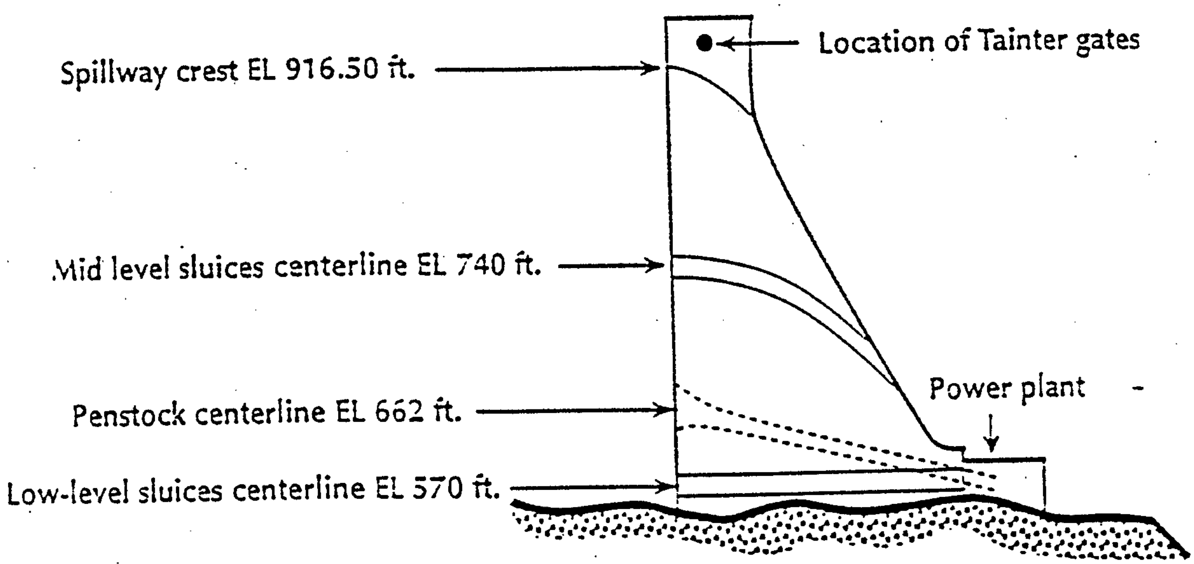
Plate 1

UPSTREAM FACE



PINE FLAT DAM

PROFILE VIEW OF DAM



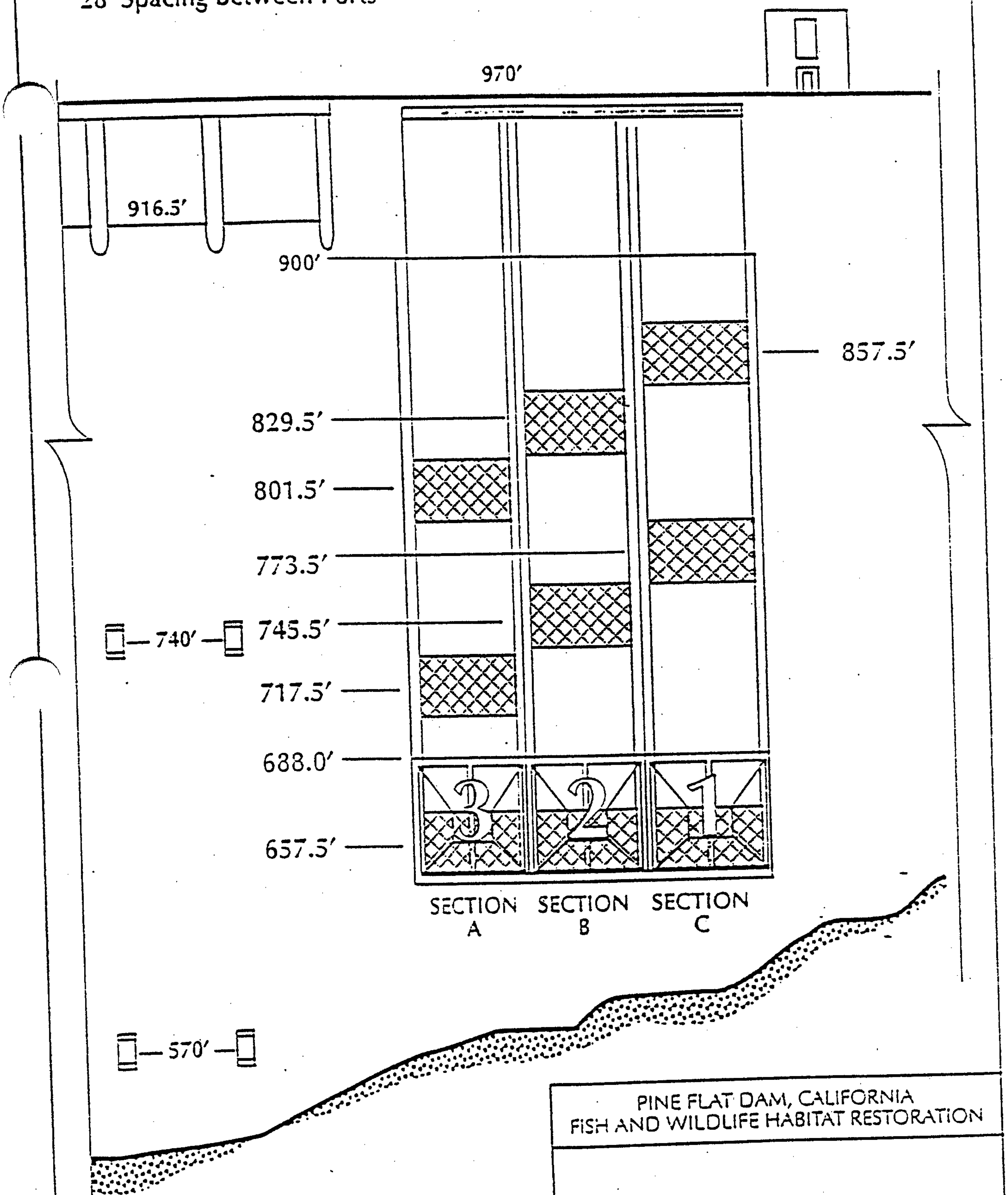
PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

UPSTREAM FACE AND CROSS-SECTIONAL DIAGRAMS OF PINE FLAT DAM

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999

25'x42' Gate Openings
28' Spacing Between Ports

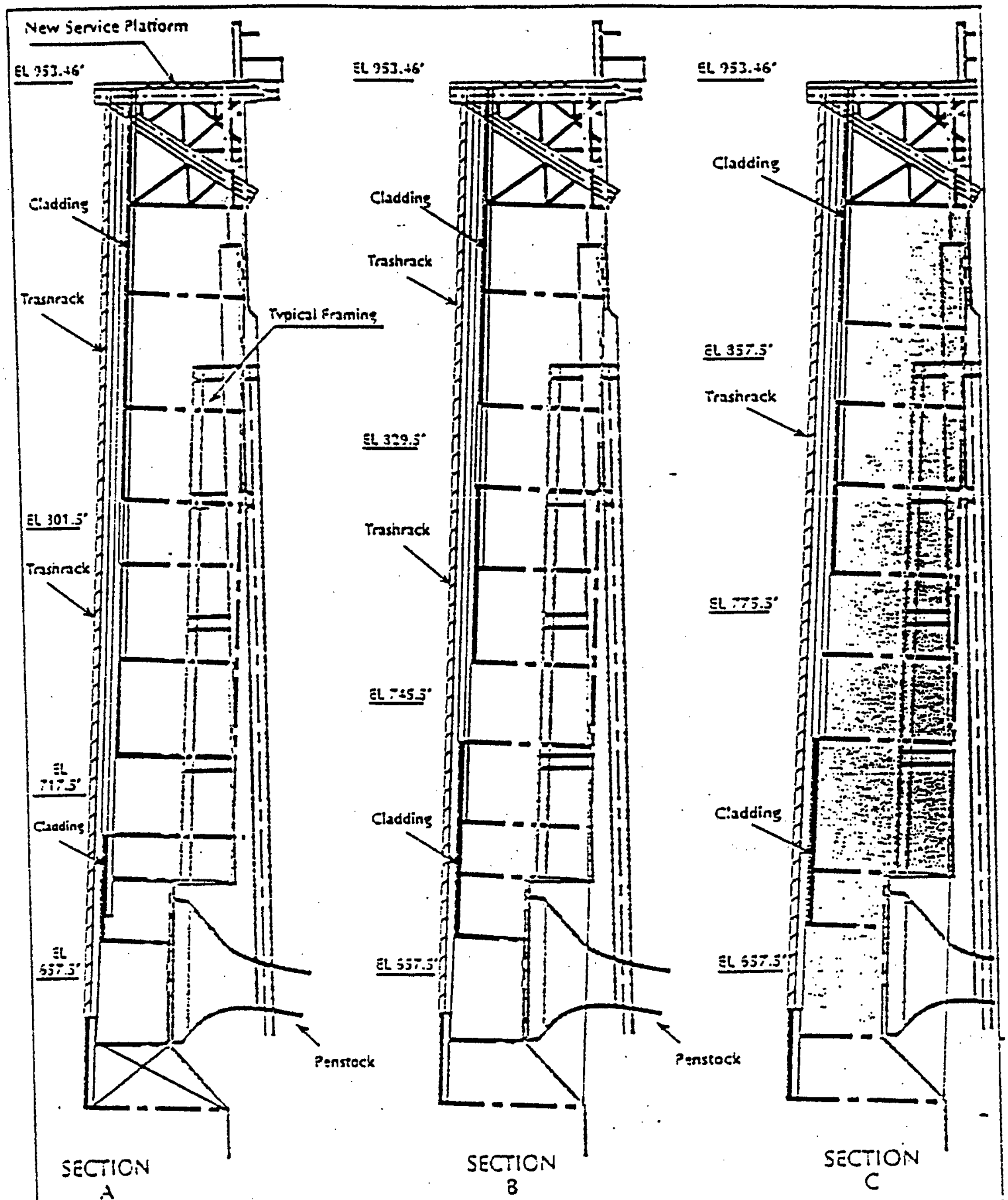
DRAFT



PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

MULTILEVEL INTAKE
STRUCTURE ELEVATION

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999

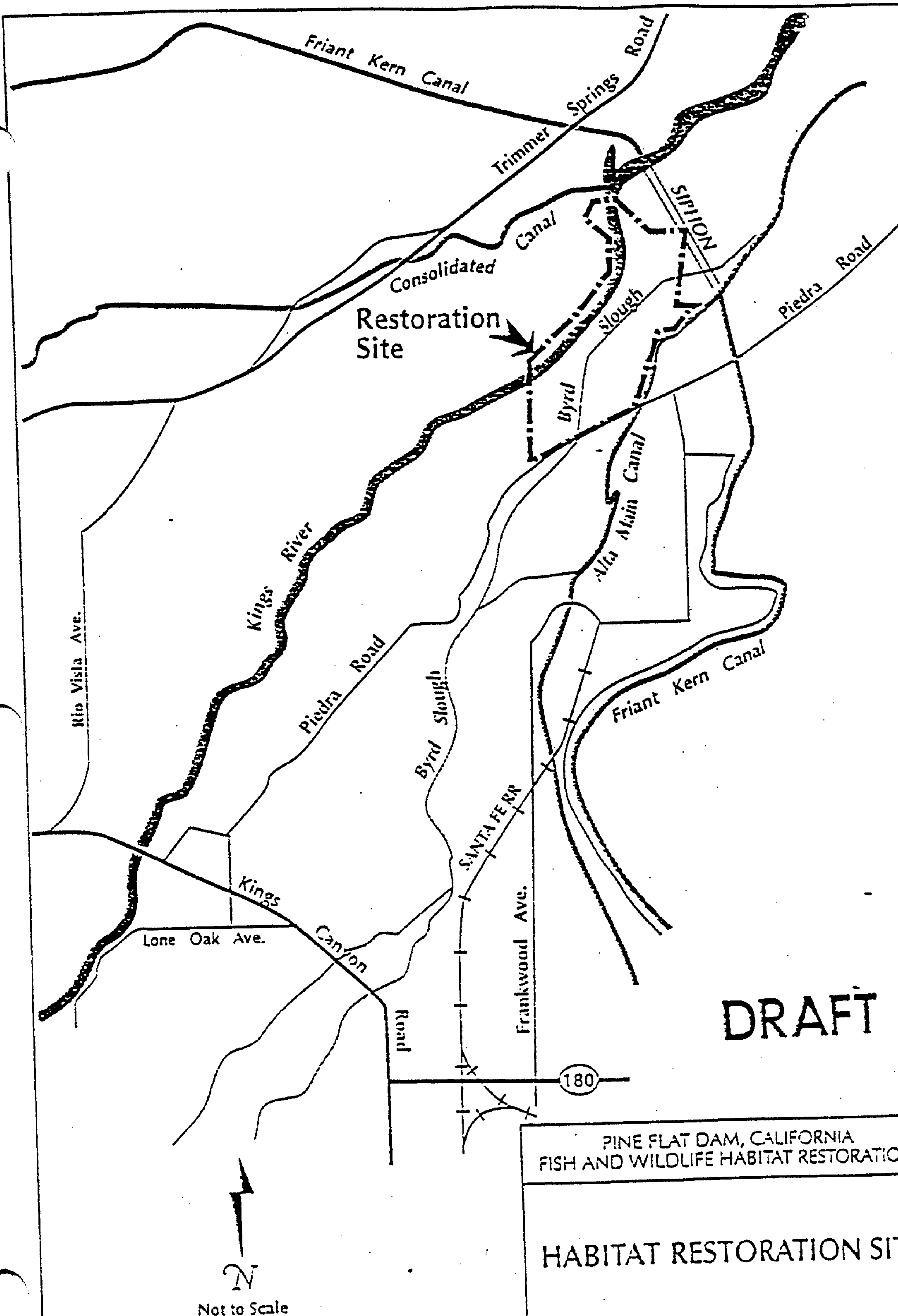


PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

DRAFT

MULTILEVEL INTAKE STRUCTURE PROFILE

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999



PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

HABITAT RESTORATION SITE

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999

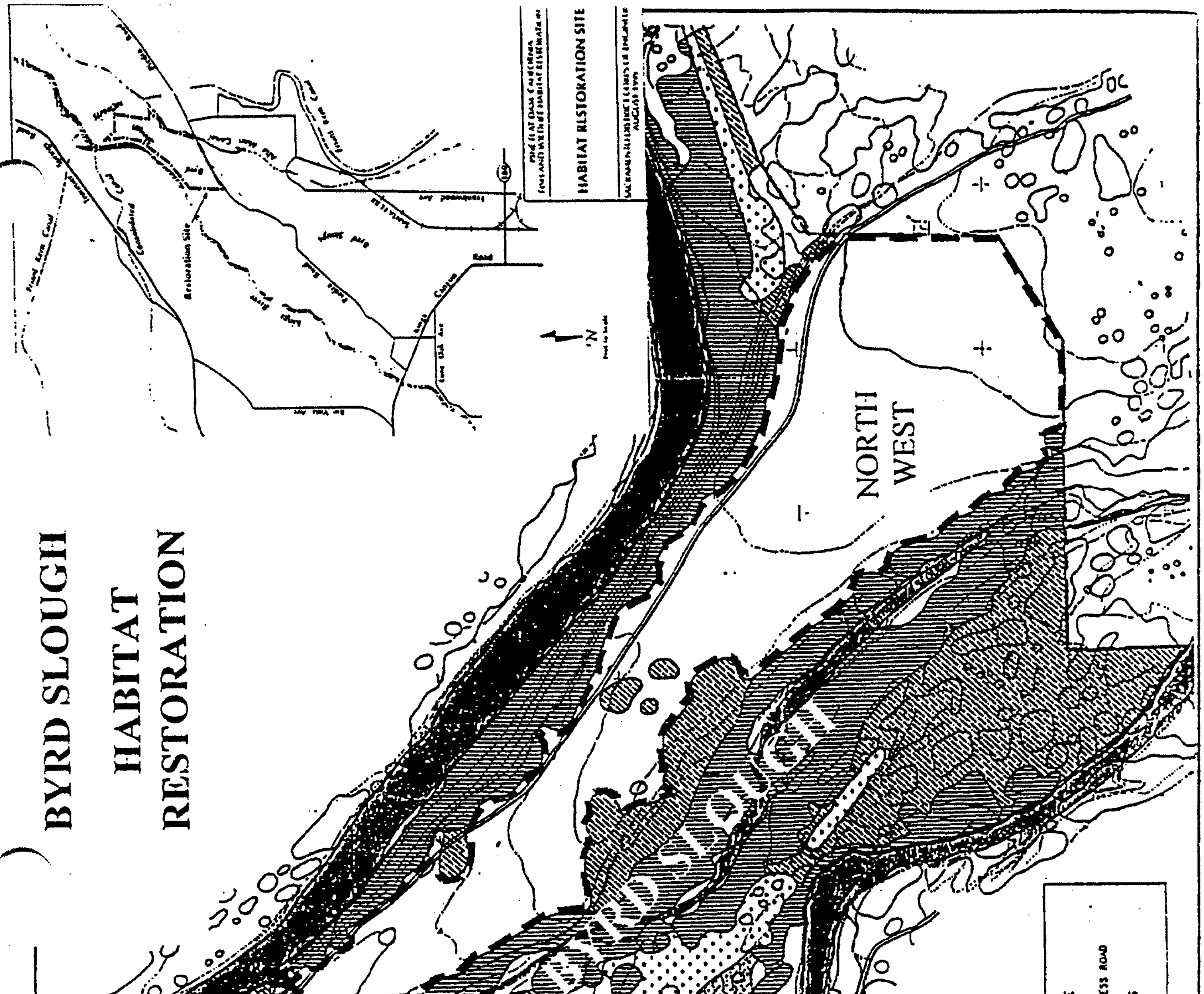
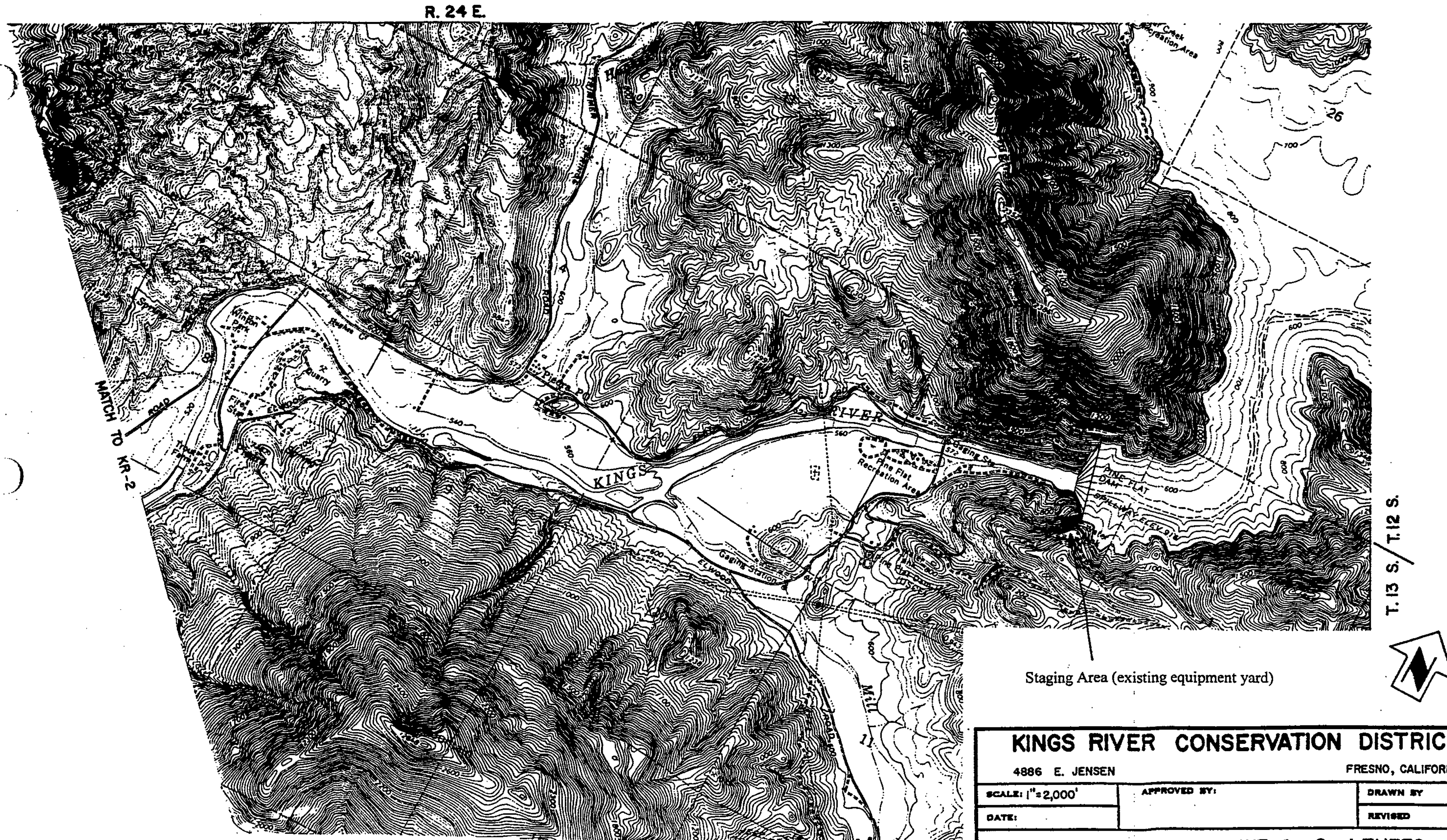

BYRD SLOUGH
HABITAT
RESTORATION
NORTH
WEST
SOUTH
EAST
BYRD SLOUGH
HABITAT RESTORATION SITE
LEGEND
MIXED RIPARIAN FOREST
VALLEY OAK WOODLAND/SAVANNAH
COBBLE
SEASONAL AND PERMANENT WETLAND
OPEN WATER
ANNUAL GRASSLANDS
SITE BOUNDARY
BOUNDARY OF PROPOSED RESTORATION AREA
EXISTING GATE
EXISTING ACCESS ROAD
PROPOSED GATE
PROPOSED ACCESS ROAD
FISHING ACCESS
ACCESS TRAIL
NORTH

Plate 6



KINGS RIVER CONSERVATION DISTRICT		
4886 E. JENSEN		FRESNO, CALIFORNIA
SCALE: 1" = 2,000'	APPROVED BY:	DRAWN BY
DATE:		REVISED
KINGS RIVER CHANNELS & LEVEES		
Multi-level intake Structure – Staging Area		DRAWING NUMBER Plate 7

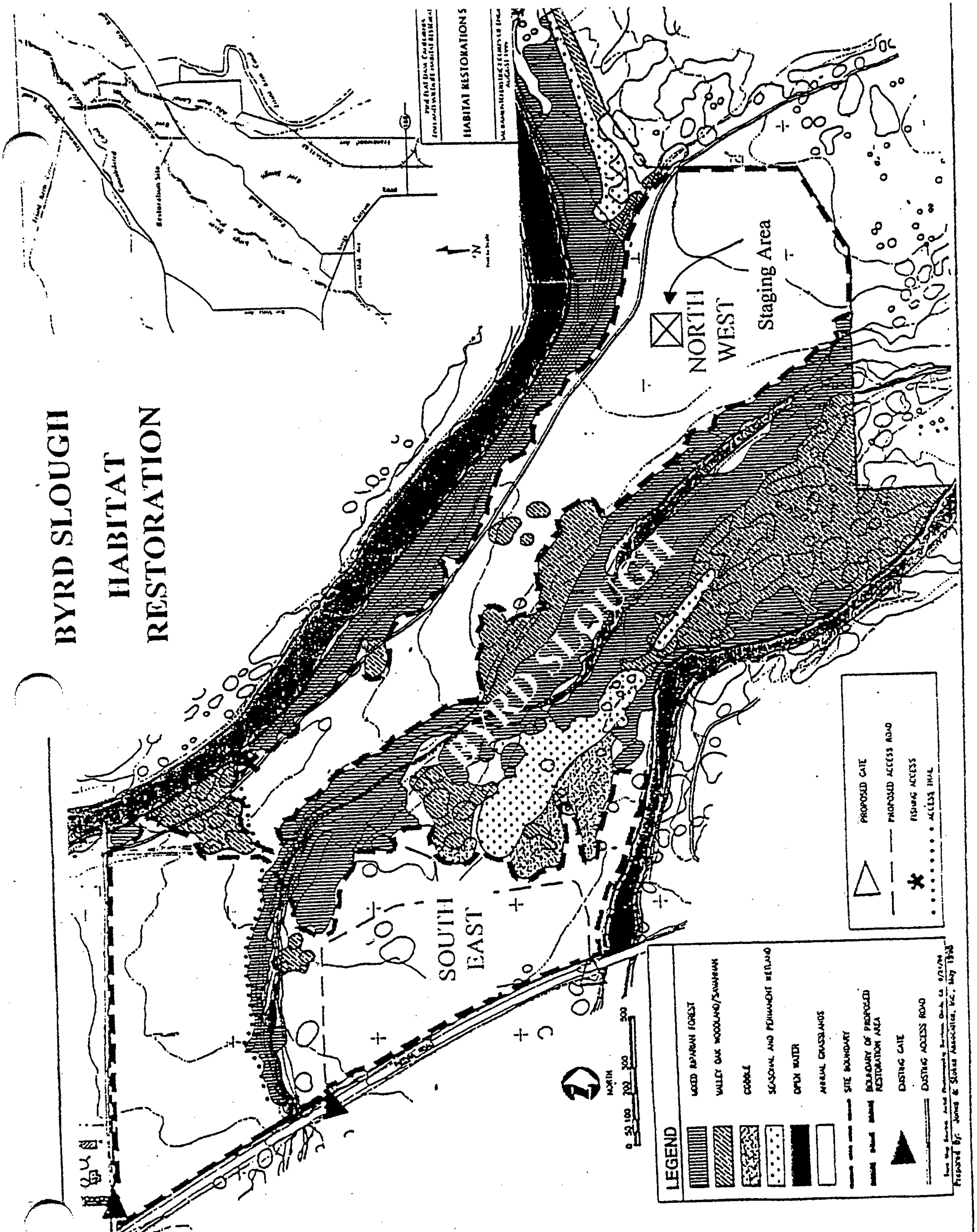

BYRD SLOUGH
HABITAT
RESTORATION
NORTH
WEST
Staging Area
SOUTH
EAST
BYRD SLOUGH
LEGEND
WOOD RIPARIAN FOREST
VALLEY OAK WOODLAND/SAVANNAH
COBBLE
SEASONAL AND PERMANENT WETLAND
OPEN WATER
ANNUAL GRASSLANDS
SITE BOUNDARY
BOUNDARY OF PROPOSED RESTORATION AREA
EXISTING GATE
EXISTING ACCESS ROAD
PROPOSED GATE
PROPOSED ACCESS ROAD
FISHING ACCESS
ACCESS TRAIL
NORTH
HABITAT RESTORATION S

Plate 8

APPENDIX A

DRAFT COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Rm W-2605
Sacramento, California 95825

IN REPLY REFER TO:

January 12, 2000

District Engineer
Corps of Engineers, Sacramento District
ATTN: Chief, Planning Division (Mark Capik)
1325 J Street
Sacramento, California 95814-2922

Subject: CESAC-Pine Flat Fish and Wildlife Habitat Restoration Project

Dear Colonel Walsh:

Enclosed is the Fish and Wildlife Service's draft Fish and Wildlife Coordination Act Report for the Pine Flat Fish and Wildlife Habitat Restoration Project. This report evaluates benefits of 3 terrestrial alternatives for oak and riparian habitat restoration at a 56-acre site near the Friant Kern Canal, and 3 aquatic restoration alternatives to improve water temperatures and/or flows for rainbow trout in the lower Kings River downstream of Pine Flat Dam.

This report has not been coordinated with the California Department of Fish and Game and the National Marine Fisheries Service. By copy of this letter, we request that these resource agencies, and other interested parties, provide any comments by February 7, 2000.

If you have any questions, please contact Brian Cordone of my staff at (916) 414-6574.

Sincerely,

Dale A. Pierce

Dale A. Pierce
Acting Field Supervisor

Enclosure

cc: FWS, AES, Portland, OR
NMFS, Santa Rosa, CA
NMFS, Sacramento, CA
CDFG, Region IV, Fresno, CA (Attn: William Loudermilk)
KRCD, Fresno, CA (Attn: Jack Sinor)
KRCD, Fresno, CA (Attn: Dale Stanton)
KRCD, Fresno, CA (Attn: Jeff Halstead)
Entrix, Walnut Creek, CA (Attn: Woody Trihey)

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE COORDINATION ACT REPORT
FOR THE

PINE FLAT FISH AND WILDLIFE HABITAT RESTORATION PROJECT, CALIFORNIA

Prepared for the

U. S. Army Corps of Engineers
Sacramento District
Sacramento, California

Prepared by
U. S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
Sacramento, California

January 2000

EXECUTIVE SUMMARY

This report evaluates the benefits of options carried forward as part of the Corps of Engineer's (Corps) Feasibility Study to address two problems associated with the construction of Pine Flat Dam: inadequate flexibility in dam operation to manage flows and coldwater reserves necessary to maintain a downstream trout fishery, and progressive conversion of native oak bottomlands in the lower watershed. The three alternatives evaluated for improved coldwater management are: 1) a multi-level intake structure that draws water from four additional levels from the dam (MLI), 2) a water transfer plan, which would result in additional flows during the post irrigation period and involve the construction of a 6-mile pipeline (WTP), and 3) a combination of both the MLI and WTP actions.

To evaluate the benefits of these management measures to rainbow trout, weighted usable area (WUA) predictions from an existing trout physical habitat model (the Fish and Wildlife Service's (Service) PHABSIM) were modified using two linked temperature models: a) a Corps 2-dimensional reservoir model that predicted daily dam outlet temperatures for these alternatives based on datasets from dry (1988), critically dry (1992) and normal (1994) years, and b) the Service's SNTEMP model, which used these outlet temperatures to predict water temperatures for the 13 miles downstream of the dam. For each river segment, the predicted temperatures were converted to a suitability index that was used to modify the WUA. After summing across segments for the June-October period, the year types were weighted by their frequency of occurrence over the long term record. This weighted sum of modified WUA, expressed as Habitat Units, was used as a measure of benefit. We also inspected individual year-type benefits for the occurrence of extinction episodes.

We determined the greatest benefit to the trout fishery would be accomplished by the combination alternative, which predicted no extinction episodes in all modeled year types, and yielded the maximum available habitat for fish. The MLI alternative alone also had no extinction, but resulted in much reduced habitat value. The WTP plan alone would result in only modest increases in habitat value above baseline, and would experience extinction in dry and critically-dry year types. The longitudinal distribution of benefits from the dam outlet varied with alternative during the post irrigation period. The MLI plan had limited benefits within the first 7 miles of stream, whereas the WTP and combination alternatives carried benefits over the entire 13 miles.

The alternatives proposed for oak-riparian restoration concern a 56-acre site located between the Kings River and the Alta Main Canal near the Friant-Kern Canal. The three alternatives are: 1) minimum - land acquisition, fencing, and placement of wildlife structures, 2) moderate - all minimum actions plus planting, and 3) maximum - all minimum actions plus planting and irrigation. Using traditional Habitat Evaluation Procedures, we predict benefits commensurate to the restoration effort, with 22.86, 57.84, and 65.03 Average Annualized Habitat Units (sum of all species models) for the minimum, moderate, and maximum alternatives, respectively.

INTRODUCTION

This is the Fish and Wildlife Service's (Service) draft detailed report on the Corps of Engineer's (Corps) Pine Flat Fish and Wildlife Habitat Restoration Project. As part of the previous reconnaissance study, we comprehensively reviewed problems created by the dam construction and operation, and recommended restoration alternatives which could restore or enhance some of the lost resource values in the project area (USFWS 1994). In the feasibility phase of this study, the Corps has carried forward options to address two specific needs: improved temperature control and flow in the lower Kings River needed to sustain a tailwater trout fishery, and restoration of oak-riparian bottomlands to support wildlife in the river corridor. The options for lower Kings River improvements are: a multi-level intake structure that draws water from four additional levels from the dam (MLI), a water transfer plan, which would result in additional flows during the post-irrigation period and involve construction of a 6-mile pipeline (WTP), and both the MLI and WTP actions (combination). The terrestrial restoration has the goal of establishing up to 30 acres of riparian and 26 acres of oak woodland habitats at a site near the Friant-Kern Canal. As alternatives, three levels of restoration effort were considered for this site.

This report provides a quantitative assessment of both the aquatic and terrestrial alternatives. The terrestrial alternatives, and terrestrial aspects of the WTP, were evaluated using conventional Habitat Evaluation Procedures (HEP). The procedure for evaluation of the aquatic alternatives employed models to predict dam outlet and downstream river temperature under various year types, that were then used to modify an existing physical habitat model using a temperature suitability index. This procedure is described in detail later in this report.

BACKGROUND

Previously, we have examined a number of water development proposals, including the initial construction of the dam, as well as subsequent proposals for diversion and offstream storage, and raising the dam (reviewed *in* USFWS 1994). Each of these projects had or would have had extensive impacts on the lower Kings River and its watershed. The only restoration study to date has been the most recent turbine installation bypass proposal, that would allow the power penstock level to be accessed in the fall when flows are insufficient for turbine bypass operation. As we discuss in our report on that project (USFWS 1996), the bypass would have only limited, 1-4°C benefits in about half the water years in which the trout fishery is thermally stressed. For the remaining below normal or drier years, additional measures would be necessary, including but not limited to the multi-level intake structure and water transfer plan options evaluated in the present report.

Pine Flat Dam and Lake are located on the Kings River, about 30 miles east of Fresno. Completed by the Corps in 1954, the authorized purposes of the dam are to increase water conservation in the watershed and reduce flooding of the Tulare Lake bed. The lake obtains an average unimpaired

inflow of 1.7 million acre-feet (ac-ft), and has a gross pool of about 1 million ac-ft. A hydroelectric plant was installed in 1984. The dam has three outlet levels separate from the power penstocks: the spillway, mid-level sluices, and low-level sluices, which are operating according to Corps criteria as described in Figure 1. Water can also be released from the power penstocks in conjunction with, or in lieu of these outlets over a fairly broad range. Historically, the lake level never fell much below 30,000 ac-ft due to agreements with upstream powerplant operators to supply water from their reservoirs when the Pine Flat Lake level was low. Today, there is a draft agreement between Kings River Conservation District (KRCD), Kings River Water Association (KRWA), and California Department of Fish and Game (CDFG) to maintain a 100,000 ac-ft minimum pool, and minimum flows, as described below.

The capability of the system to sustain a river temperature cool enough to support trout is influenced greatly by flow and minimum storage. Flow downstream of the dam is determined for most of the year by flood control, irrigation and conservation needs. Compared with unimpaired flows, today's operations results in: a) peak discharges about 1 month later, in June; b) very high discharges during the irrigation season (June through September); and c) much lower releases during the post-irrigation period prior to fall rains (October and November). During these low-flow periods, flows may approach the draft agreement criteria of 100 cubic feet per second (cfs) at Piedra and 35-45 cfs past the Fresno Weir, especially during low water years. These low flows can result in rapid warming downstream of the dam to temperatures that are lethal to trout.

Temperatures at the dam outlet vary in a manner that is predicted coarsely by minimum storage, although the timing and temperature of inflows are probably influential (KRCD 1996, USFWS 1996). In general, when minimum storage is at least 315,000 ac-ft, cool water releases are maintained throughout the year. Without a turbine bypass, outlet temperature exceeds 20°C when minimum storage is less than 315,000 ac-ft. With such a bypass, we expect that minimum storages less than about 179,000 ac-ft would result in outlet temperatures above 20°C in the fall. Such minimum storages are commonly encountered in dry and critically dry water years, and largely explain the success or failure of the tailwater trout fishery.

The river morphology and substrate vary downstream of the dam. The 4-mile reach from the dam to Piedra is typical tailwater, with broad riffles and runs over very large cobble, and with patches of mature riparian cover at the river margin. Downstream, the river begins to braid, and the flow is greatly reduced by withdrawal from several major diversion weirs. As the gradient decreases beginning at about the Highway 180 crossing, the river separates into several distributaries, riffles become less prominent, but gravels are smaller. In fact, some riffles with suitable gravel for trout spawning and good riparian cover occur near Goodfellow Avenue, about 18 miles downstream of the dam. This general area, from Goodfellow Avenue to the Fresno Weir, is known as the Centerville Bottoms. Downstream, two high ridges compress the distributary flow into a single channel just north of Reedley, called the Reedley Narrows.

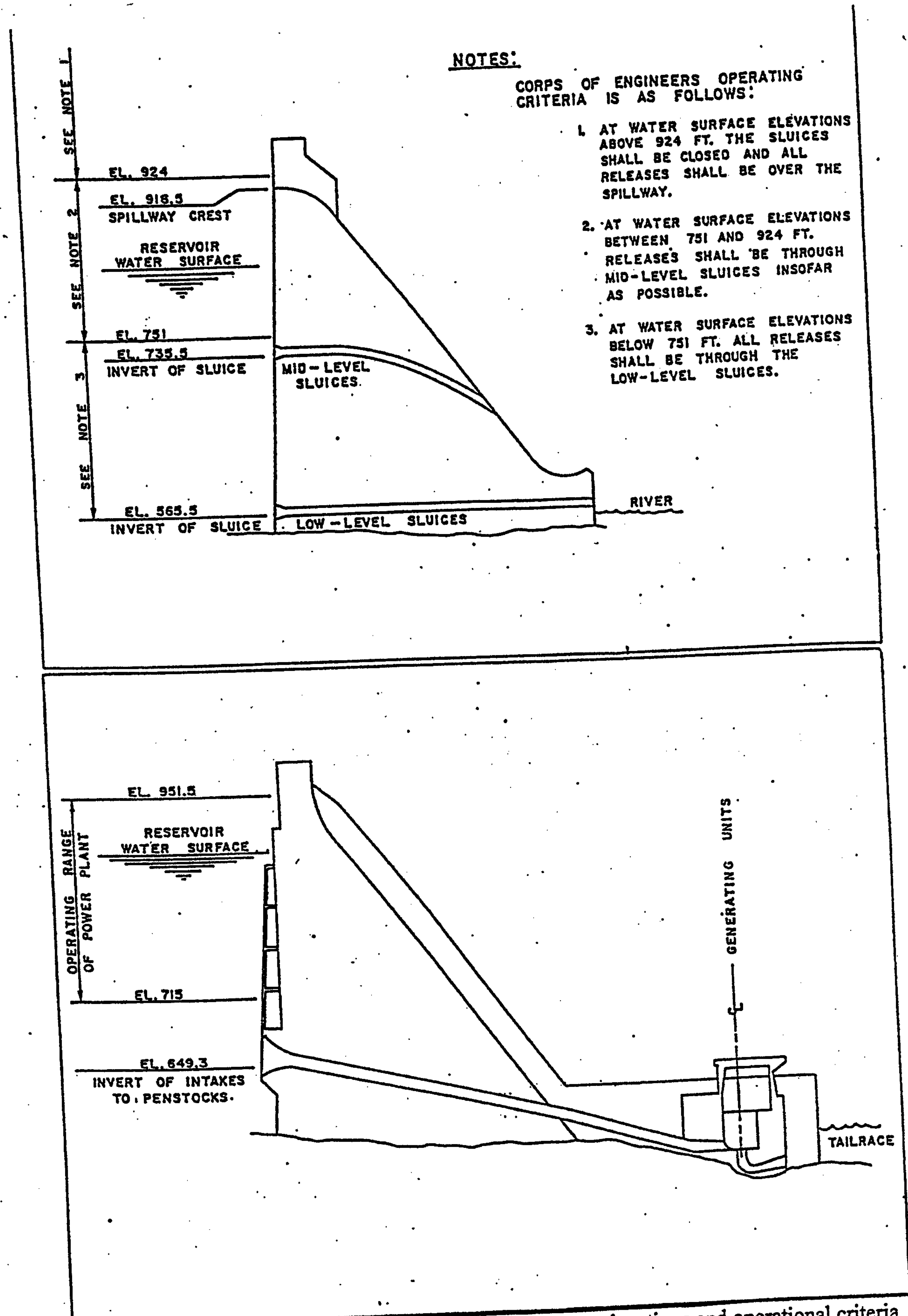


Figure 1. Cross-sections of Pine Flat Dam, illustrating release elevations and operational criteria for the spillway, sluiceways, and power penstocks.

Previously, we annotated studies documenting habitat loss in the river corridor and wetland areas in the Tulare Lake bed (USFWS 1994). For example, in the 20 years following construction of the dam in 1955, half of the riparian area was lost (about 2,600 acres) as well as 21 percent of the oak bottom (300 acres) (Sportfishing Institute 1983); much more has undoubtedly occurred since then. With construction of Pine Flat Dam, much larger areas of seasonally flooded and fallow lands, up to 100,000 acres, were also converted from unmanaged natural habitat, including wetland, into agricultural crops. Although some of this is grain which is of some value to wildlife depending on management, the most common crop is cotton. The most prominent direct losses due to flood protection occurred in the Tulare Lake bed area, which was formerly used for flood control.

FISH RESOURCES

Because we have recently reviewed the historical information on fishery monitoring and stocking practices in the lower Kings River (USFWS 1994, 1996), only a selective review is provided here. The Kings River downstream of Pine Flat dam supports a number of native warmwater species typical of California foothill streams, as well as trout, and other non-native species. The most abundant native warmwater species are the Sacramento pike minnow and sucker, with lesser abundances of sculpins, hitch, hardhead, stickleback and California roach. One species of concern, the Kern brook lamprey, occurs in several distributaries and sloughs. Warmwater non-native species include golden shiner, smallmouth and spotted bass, various sunfish, and several catfish species, most of which were originally planted in the lake.

Rainbow trout are present and do well during consecutive normal or wetter water years, but are heavily fished and the river experiences temperatures that are lethal to them in the fall season of lower water years. During these low water years, the fish community shifts to dominance by warmwater species, especially Sacramento sucker and pike minnow. Over the long term, trout are principally maintained through an active planting program and not by natural recruitment. Because of the importance of trout as a sport fishery, considerable study and management efforts have been conducted on potential trout habitat in the lower Kings River. Rainbow trout are a commonly stocked species in low-elevation dam tailwaters throughout California. The species prefers cool temperatures, well-oxygenated waters, and abundant invertebrate forage. It spawns in the spring, with the eggs laid in small-graveled riffles. The young hatch in 3 weeks, emerge from gravel after 6 weeks, and matures in 1 to 5 years.

As part of an instream flow study, Trihey et al. (1992) typed the distribution of habitat between the dam and Fresno Weir as 64 percent runs, 14 percent riffles, and 22 percent pools at a flow of 250 cfs. That study found gravels suitable for trout spawning to be quite limited; with a few patches near river miles 7, 9 and 10, and much farther downstream near the Centerville Bottoms. In-water cover, depth complexity, and riparian vegetation are also quite limited, with the best riparian canopy between river miles 7 and 9. During the irrigation period, streamflow decreases

longitudinally from the dam due to a number of major diversions in the first 10 miles. Trihey et al. (1992) established that habitat quantity increased the most in the range of 25 -200 cfs.

WILDLIFE RESOURCES

The riparian areas along the river are frequented by waterbirds such as ducks, herons, and kingfishers, acorn woodpeckers, and various songbirds. Reptiles and amphibians also occur there, and include the southwestern pond turtle, southern alligator lizard, western toad, bullfrog, kingsnake, and very abundant western rattlesnake, among others. In both the riparian areas as well as the uplands, the most common mammals, other than livestock and domestic pets, are coyotes and foxes, raccoons, skunks, deer, muskrats, squirrels, opossums, rabbits, and various small rodents.

VEGETATION

The areas of consideration for this report include the lower Kings River downstream of Pine Flat Dam, a 56-acre site near the Friant-Kern Canal, and a potential pipeline route between west Fresno and the Mendota Pool. The habitat along the lower Kings River includes some riparian vegetation, with mature cottonwood and sycamore overstory and an understory of shrubs and vines, but this is not continuous. Portions of the river bank are barren of woody vegetation, and much of the adjacent lands are managed for agriculture or grazing, and some has been developed into residences. Oak woodlands are present in a few locations, but the overall area has been greatly diminished over the past 50 years (USFWS 1994). To a large extent, non-native herbaceous species such as star thistle dominate the 56-acre restoration site, which is also grazed. The potential pipeline route for the water transfer plan transects uplands, orchards, as well as a minor component of vernal pools. These pools are known to support a number of endemic plants and animals, some of which are listed species.

ENDANGERED SPECIES

Appendix A provides a list of species dated December 27, 1999, and a summary of a Federal agency's responsibilities under section 7(a) and (c) of the Endangered Species Act (Act) of 1973, as amended. Of the species identified, the Fresno kangaroo rat, blunt-nosed leopard lizard, San Joaquin kit fox, and the vernal pool fairy shrimp could be present in the area of the pipeline which would be constructed for the proposed WTP or combination alternatives. Such species are not present in areas affected by the other alternatives.

TROUT ENHANCEMENT ALTERNATIVES

MULTI-LEVEL INTAKE STRUCTURE - The position of the penstocks (el. 649.3) and low-level sluices (el. 565.5) were designed to be as low as possible in order to maximize the range of power

generation and water yield, and water can only enter the penstocks through that one level. During spring and early summer power generation, the coldest water is used first, prematurely depleting the coldwater reserve in the lake, and resulting in warm water discharges later in the year that are lethal to trout. Although it would be possible under certain conditions to mix releases from the mid-level and power penstocks, this would result in reduced energy production unacceptable to the local sponsor. The separate problem of switching from the penstocks to either the mid- or low-level sluices when flows drop below 500 cfs in the fall does not apply to our evaluation, because we assume installation of a turbine bypass as a baseline condition.

The proposed MLI structure would fit over the rear face of the dam, extending from just below the spillway down to the bottom of the penstocks, enabling choice of access water from any of eight levels while maintaining the ability to pass the discharge from any level through the turbines. Gates would be placed at the existing penstock and mid-level sluiceway levels, as well as four levels above the mid-level sluiceway and one level between the mid-level and penstock level (Figure 2). Water could also be accessed from the lower-level sluiceway. Based on fishery needs, and overall coldwater supplies predicted from monitoring lake temperature and inflows, the level would be selected in a way which best extends the coldwater reserve.

WATER TRANSFER PLAN - Presently, Kings River flows are reduced at the end of the irrigation season to an extent that, under some conditions, the river quickly warms to temperatures that are lethal to trout. This plan involves an exchange of water sources and timing of deliveries that would result in an increased flow on the lower Kings River in the critical post-irrigation period. Currently, water from Millerton Lake is delivered by the San Luis Unit of the Central Valley Project to the Mendota Wildlife Management Area year round. The timing of this delivery is not critical to the refuge as long as the monthly water requirements are met. Under the WTP, some of this water supply would be routed through the Friant-Kern Canal to the Kings River service area in June, July and August, to meet irrigation demands that would otherwise come from Pine Flat Lake. This stored water would remain in the lake until fall, when it would be released to augment river flows during the critical period of September through November. The water would then flow through the Fresno Irrigation District (FID) system and west to the Mendota Pool, where it would replace the supply to the refuge. The benefits of such an operation would be two-fold; first, the additional 30,000 ac-ft which would be retained through the summer would increase the coldwater reserve available later in the year. Second, the increase from a 100 cfs baseline flow to 180 cfs with the transfer could result in reduced river temperature downstream and increased habitat area.

In order to convey this transferred water to the Mendota Pool, a 6-mile pipeline would need to be constructed from the end of the FID system (intersection of Howard and Central Avenues), and terminate at the Fresno Slough flood channel near the upper end of Mendota Pool near El Dorado Avenue (Figure 3).

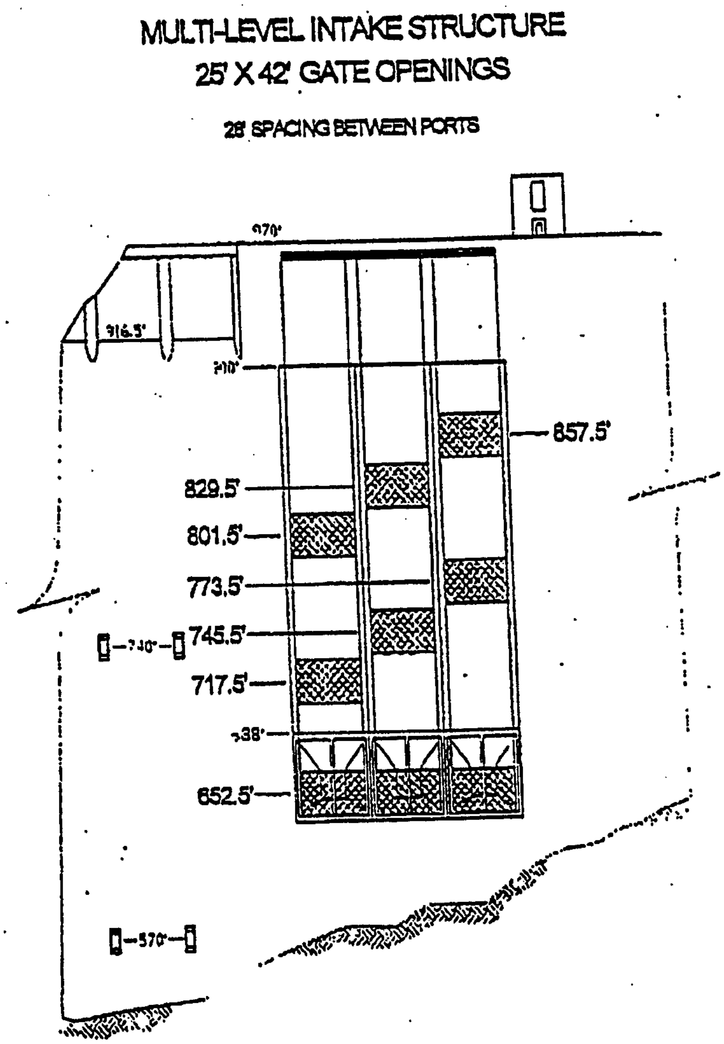


Figure 2. Proposed multi-level intake elevations on Pine Flat Dam for the Pine Flat Fish and Wildlife Habitat Restoration Project.

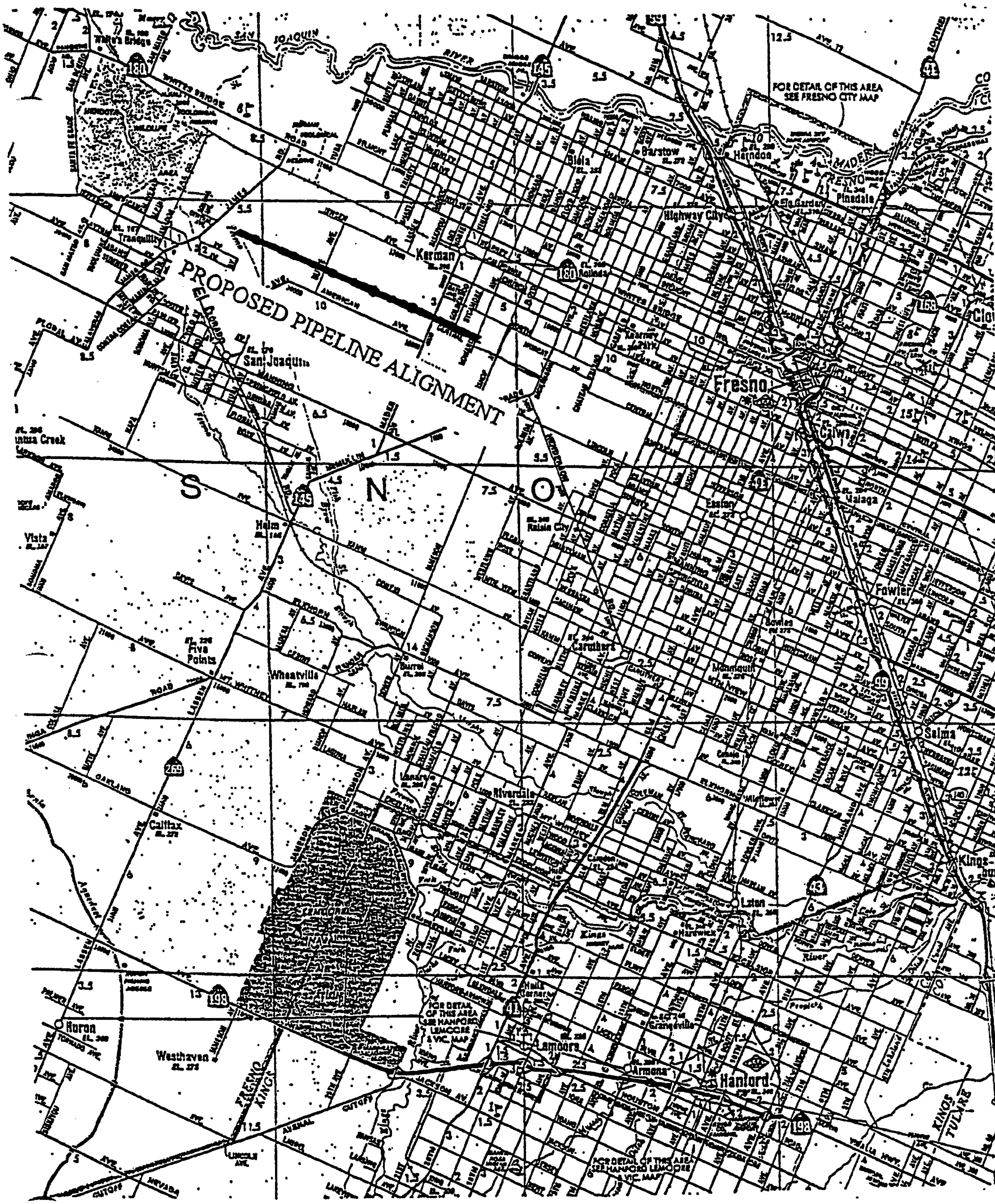


Figure 3. Project location and pipeline alignment of the water transfer plan alternative for the Pine Flat Fish and Wildlife Habitat Restoration Project (AAA, 1996).

COMBINATION ALTERNATIVE - This alternative would consist of both the multi-level intake structure and water transfer plan.

TERRESTRIAL RESTORATION ALTERNATIVES

The following alternatives apply to a 56-acre site near the Friant-Kern canal. It is located in the southeastern portion of the San Joaquin Valley between the Kings River to the northwest, and the Alta Main Canal to the southeast (Figure 4). The three terrestrial restoration action alternatives that were evaluated along with the no action alternative are: minimum - This level of restoration would consist of land acquisition, fencing, and placing wildlife structures; moderate - This would consist of land acquisition, fencing, planting, and placing wildlife structures; and maximum would consist of land acquisition, fencing, planting, irrigating, and placing wildlife structures. The alternatives have the same goal of converting the grazed annual grassland to riparian and oak woodland habitat, but differ in the level of management and manipulation effort. A separate HEP report, including assumptions, calculations, and models, is provided in Appendices B and C.

MINIMUM TERRESTRIAL RESTORATION - Under this alternative, the riparian and oak woodland area would be fenced, and wildlife structures would be installed. Wildlife structures that would be installed include brush piles, bluebird boxes, bat boxes, raptor perches, wood duck boxes, and song bird perches. For a complete description of the wildlife structures see JSA (1997).

MODERATE TERRESTRIAL RESTORATION - The riparian and oak woodland area would be planted with 900 plants per acre, a 3-year maintenance period would be implemented, and placement of wildlife structures would occur. The type of wildlife structures that would be constructed are the same as described in the minimum alternative.

MAXIMUM TERRESTRIAL RESTORATION - The area would be planted with 250 plants per acre, the plantings would be irrigated, a 5-year maintenance period would be implemented, and placement of wildlife structures would occur. The type wildlife structures that would be constructed would be the same as described in the minimum alternative.

METHODOLOGY

Terrestrial analyses: Conventional HEP was applied to the terrestrial alternatives and terrestrial impacts of the water transfer plan, and a full report on each is provided in Appendices B and C.

Aquatic analyses: Trihey (1992) used the Service's PHABSIM model, which estimates available habitat for fish species by examining variables of depth, substrate type, and water velocity compared to idealized preferences and weighting the areas accordingly; the sum of which is referred to as Weighted Usable Area (WUA). PHABSIM does not normally consider temperature.

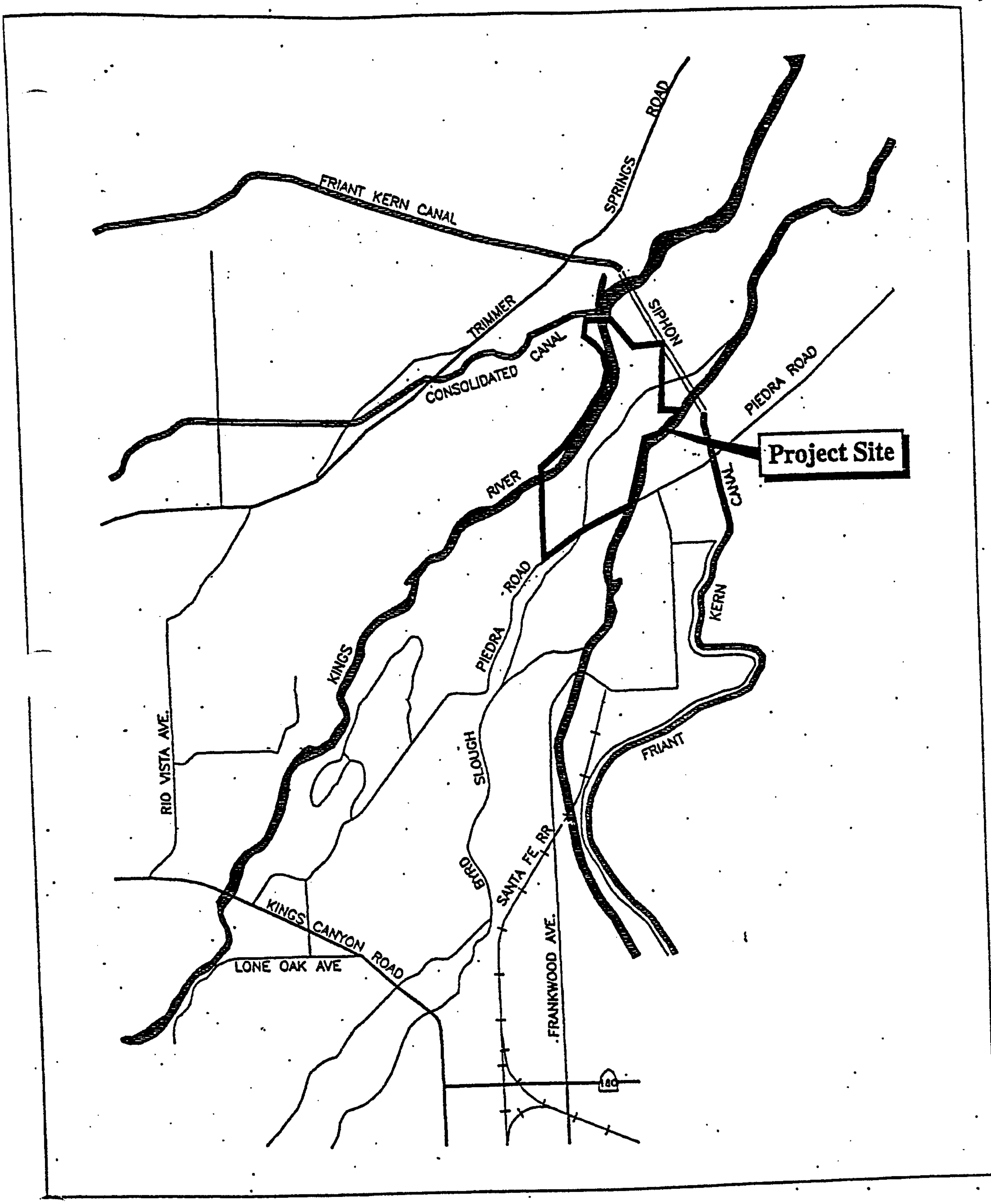


Figure 4. Project location of oak and riparian restoration site for the Pine Flat Fish and Wildlife Habitat Restoration Project.

Therefore, a separate analysis was developed to modify the Trihey results using temperatures obtained from a Corps reservoir temperature model (CE-QUAL-W2) and a Service river temperature model (SNTEMP) applied to the three alternatives for representative year types. The period of evaluation is June 1 - October 19. The Corps reservoir model, which provided a daily temperature at the dam outlet, was first calibrated to actual temperature data collected during dry (1988), critically dry (1992), and normal (1994) years, the full range of conditions under which we expected the alternatives to have potential benefit. The SNTEMP model was then applied to predict temperatures in one-mile segments downstream of the outlet assuming observed flows during those years. That model was also calibrated to actual river temperatures. These segment temperatures were then used to select a "HEP-like" suitability index that reflected the impact of temperature stress, which is justified in more detail below. These daily suitability indices were multiplied by the weighted usable areas (WUA) for the segments determined by the WUA-flow relationships established by Trihey (1992) as applied to the daily flow for the three model years, and across segments as a measure of habitat value. This quality-quantity product, expressed in Habitat Units (HUs) has a theoretical maximum (optimum temperature and flow throughout) for the project area, of 1.76 HUs. We conducted independent analyses for both adult and juvenile life stages of trout, and found that the patterns of benefit between alternatives is substantially the same for both life stages; however, because the habitat value for juvenile trout was half that of the adults, our presentation of results is limited to the adult benefits. These baseline benefits were derived from actual flows and temperature.

The models were then re-run for all three year types again for each of the three alternatives, using the same atmospheric and river inputs as the baseline, but with the different reservoir operations assumed for these alternatives. For the MLI alternative, switching to the next lower port was modeled to occur when the outlet temperature exceeded 18°C. These individual scenarios were then compared with the baseline for differences in HUs during the period of analysis, and for extinction episodes (absence of HUs). Finally, a theoretical average benefit was calculated by adding the sums of the three year types multiplied by the frequency of those year types over the long term record. The frequencies of occurrence of dry, critically dry, and normal water years are 16, 7, and 53 percent, respectively.

The approach used has the following explicit assumptions: 1) the turbine bypass is constructed; 2) average daily temperatures were used to represent temperatures for the whole mile segment; 3) 1988 adequately represents a dry water year and occurs 16 percent of all the water years; 4) 1992 adequately represents a critically dry water year and occurs 7 percent of all the water years; 5) 1994 adequately represents a normal water year and occurs 53 percent of all the water years; and 6) all additional assumptions in the Trihey et al. (1992) and KRCD (1996) modeling, including those inherent in the Service's PHABSIM and SNTEMP models.

These assumptions create an analytical procedure which is approximate, but not precise. Obviously, the temperatures within each segment of the river are not the assumed uniform number,

but vary with depth, shade, time of day, and cross-section. Actual real-time operations are likely to be considerably more flexible than the single, 18°C threshold for port switching, and the reservoir conditions will vary considerably within year types due to variability in inflow and upstream operations, power demands, and other unknowns. However, we believe the approach adequately quantifies the relative differences between alternatives and year types.

Temperature Suitability Index: A suitability index curve (Figure 5) which is applied to our analysis was constructed after a review of literature pertaining to the effects of temperature on growth and survival of rainbow trout, and has been accepted by the Corps, KRCD, and CDFG for the purposes of this project. The key elements of the curve are a lower limb, within which growth increases with temperature, a constant middle range within which growth and survival are optimal, and an upper limb, within which survival and growth decline (or become negative). Much of the following information below is repeated from our earlier report (USFWS 1996), to justify the SIs selected for these portions of the curve.

The lower end point of the optimum growth range is generally considered about 12°C, however, temperatures less than this result in only a mild reduction of growth, and would not be lethal. Under the most ideal conditions (food in excess, saturated oxygen), the thermal optimum for trout with a diel fluctuation of ±3.8°C is 15.5°C (Hokanson et al 1977); similar to the 15°C "Standard Environmental Temperature", or SET, issued by the National Resource Council (Piper et al. 1982). This is slightly greater than the 13.8°C recommended by the Corps (Bell 1990), although less than the 19°C upper limit of optimum value recognized in the Service's rainbow trout Habitat Suitability Index Model (Raleigh and Hickman 1984). Where diel fluctuations exceed 2°C, Hokanson et al. (1977) advise a conservative upper end point standard of 17°C for the mean weekly temperature. Such diel fluctuations have been documented by KRCD in the lower Kings River, only a few miles downstream of Pine Flat Dam. Taking growth and mortality into account, Hokanson et al. (1977) illustrate a rapid decline in yield between 15.5 and 20.5°C.

Classical bioenergetic models describe an interaction between food and temperature for salmonids (e.g. Elliot 1976); the upper optimum temperature declines as food becomes less than non-limiting. Therefore, the criteria set using assumptions of excess food and fully-oxygenated water (Hokanson et al. 1977, Piper et al. 1982), should be considered absolute maximums. As temperature exceeds the optimum of 15.5°C, oxygen and food demands increase dramatically for trout. At about 21°C, the fish's metabolism is such that it begins to lose weight no matter how much food is supplied. In one study (Ojolick et al. 1995), 40 percent of acclimated fish died in the first 23 days of chronic exposure to a constant 21°C.

The upper lethal limits of trout are believed to be as high as 28-29°C (Moyle 1976, Bell 1990). However, these very high temperatures refer only to very brief exposures (a few hours or less) which result in immediate death. This lethal temperature is indicative only of acute physiological

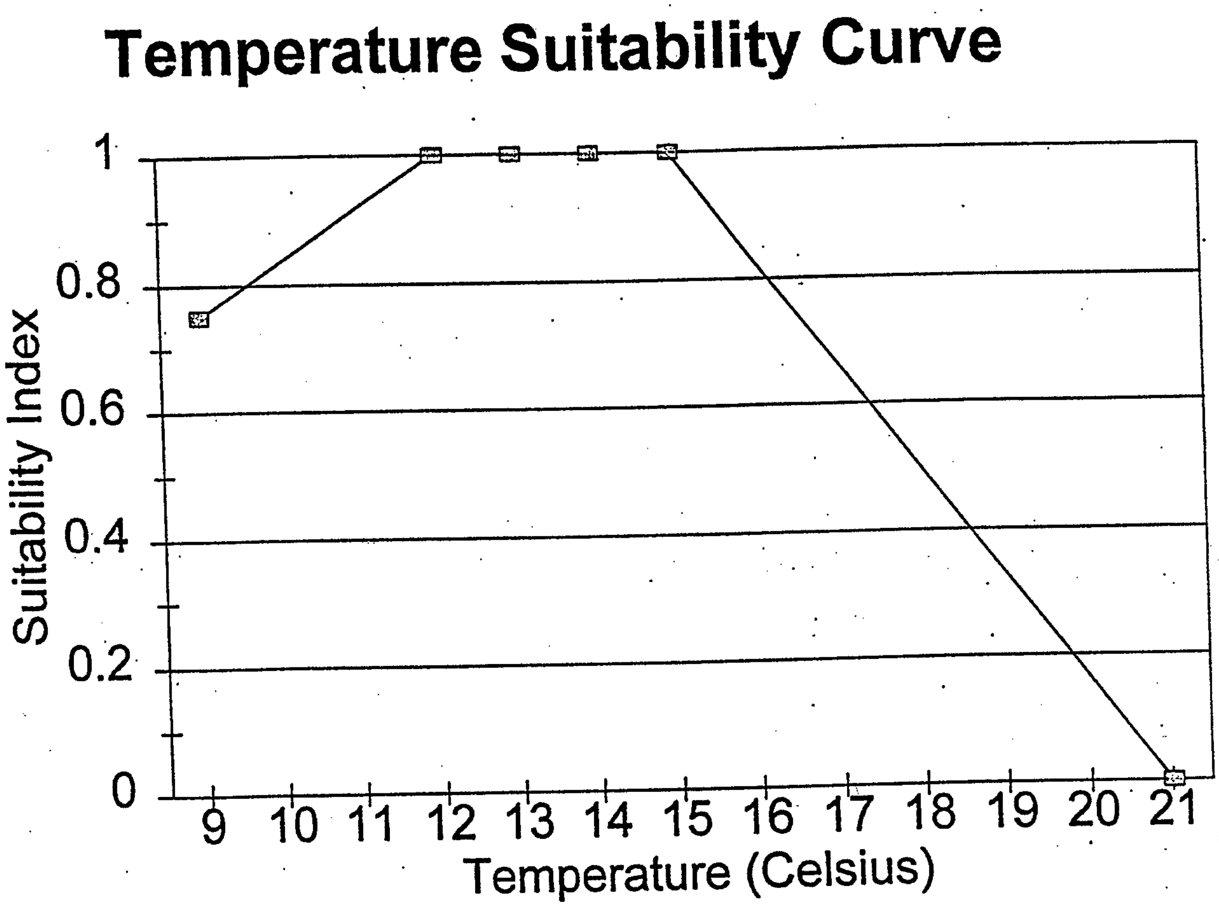


Figure 5. Temperature suitability index curve for modification of weighted useable area for rainbow trout in the lower Kings River.

dysfunction, and does not take into account effects caused by delayed mortality due to stress, disease, or other causes, or effects on gamete viability.

The upper lethal limit is not recognized by the Service or any other national or international authority as a useful criterion for conservation of trout water. In the absence of some form of thermal refugia, rainbow trout generally do not occur in rivers where there is prolonged exposure to a mean daily temperature of greater than 20°C.

The curve which we developed is consistent with these known relationships and interactions. We selected 0.75 as the minimum on the lower limb, at 9°C, because growth is partially impaired, but not survival. We chose an optimum range of 12-15°C with an SI of 1.0, because growth and survival are both optimized within this range.

Finally, we selected 21°C as the upper limit for a positive SI value, as it is clear from these studies that growth is severely impaired, and chronic exposure would be lethal. Although it may be argued that 21°C would eliminate value and should be lower, we felt it appropriate in that the actual exposures under the modeled conditions were shorter than would be necessary to cause death, and that there may be some heterogeneity within the stream channel that would create very limited microhabitat areas within which trout could endure exposure.

RESULTS

Terrestrial Restoration Alternatives: All of the alternatives would eventually result in replacement of the annual grassland within the 56-acre site to riparian and oak woodland, but would vary in the time that it takes to begin to accrue habitat value; 20 years for the minimum alternative, and 5 years for the moderate and maximum alternative. In addition, the maximum alternative achieves the fastest regeneration rate, as it is the only alternative with irrigation. Over the period of evaluation, the predicted average increases in habitat value over baseline are 22.86, 57.84, and 65.03 Average Annualized Habitat Units for the minimum, moderate, and maximum alternatives, respectively (Tables 1, 2, 3). The improvement with the maximum alternative results from enhanced oak regeneration, explaining the increased habitat value predicted by the oak woodland species models. The ultimate result of any of the alternatives would be the same; creating roosting, nesting, and foraging habitat for various bird and mammal species.

Aquatic Restoration Alternatives: The total temperature - weighted habitat area (HUs) for all river segments is shown in Figures 6-8 for each year type, and the long term weighted sums for the alternatives (measure of average benefit) is shown in Figure 9. Although the pattern is similar for the average benefit, we discuss the individual year types first to illustrate differences in the occurrence and length of extinction episodes (total loss of HUs).

The WTP alternative results in a consistent increase over the baseline in the early part of the summer. This increase eliminates the extinction episode in normal years only, but the habitat area

Table 1. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Habitat Restoration Project, minimum terrestrial alternative.

COVER-TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH-THE-PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Riparian	Gray fox	0.0	30	+30	11.29	20.05	+8.76
	Yellow warbler				0.0	4.53	+4.53
Annual Grassland	(not analyzed in HEP)	56	0	-56	NA	NA	NA
Oak woodland	Plain Titmouse	0.0	26	+26	1.8	5.73	+3.93
	Gray fox				6.44	12.08	+5.64
Totals		56	56	0	19.53	42.39	+22.86

Table 2. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Habitat Restoration Project, moderate terrestrial alternative.

COVER-TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH-THE-PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Riparian	Gray fox	0.0	30	+30	11.29	27.33	+16.04
	Yellow warbler				0.0	22.74	+22.74
Annual Grassland	(not analyzed in HEP)	56	0	-56	NA	NA	NA
Oak woodland	Plain Titmouse	0.0	26	+26	1.8	9.69	+7.88
	Gray fox				6.44	17.62	+11.18
Totals		56	56	0	19.53	77.38	+57.84

Table 3. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Habitat Restoration Project, maximum terrestrial alternative.

COVER TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH THE PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Riparian	Gray fox	0.0	30	+30	+11.29	+20.05	+8.76
	Yellow warbler				0.0	+22.75	+22.75
Annual Grassland	(not analyzed in HEP)	56	0	-56	NA	NA	NA
Oak woodland	Plain Titmouse	0.0	26	+26	1.8	+17.5	+15.7
	Gray fox				+6.44	+24.26	+17.82
Totals		56	56	0	+19.53	+84.56	+65.03

Figure 6. Total Habitat Units (acres/13miles) for adult trout in a normal water year below Pine Flat Dam.

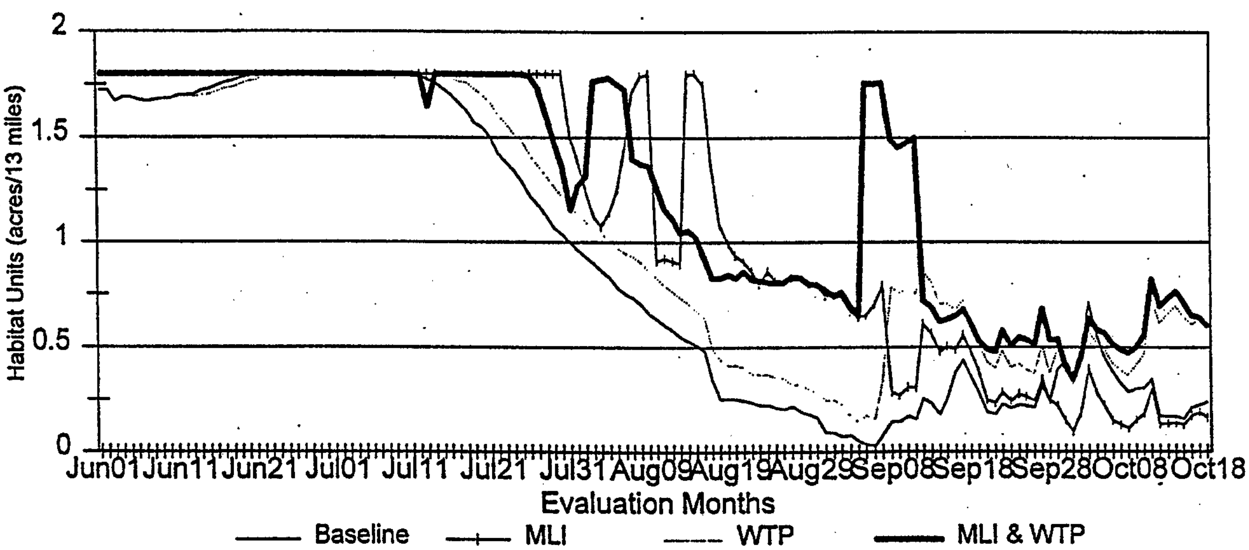


Figure 7. Total Habitat Units (acres/13miles) for adult trout in a dry water year below Pine Flat Dam.

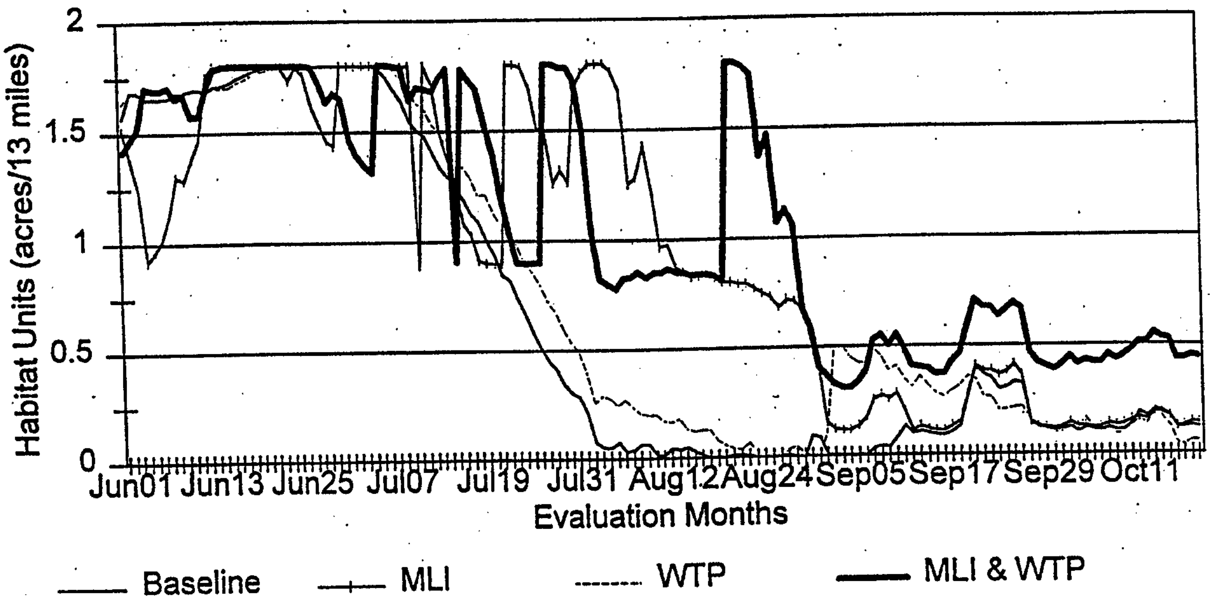


Figure 8. Total Habitat Units (acres/13miles) for adult trout in a critically dry water year below Pine Flat Dam.

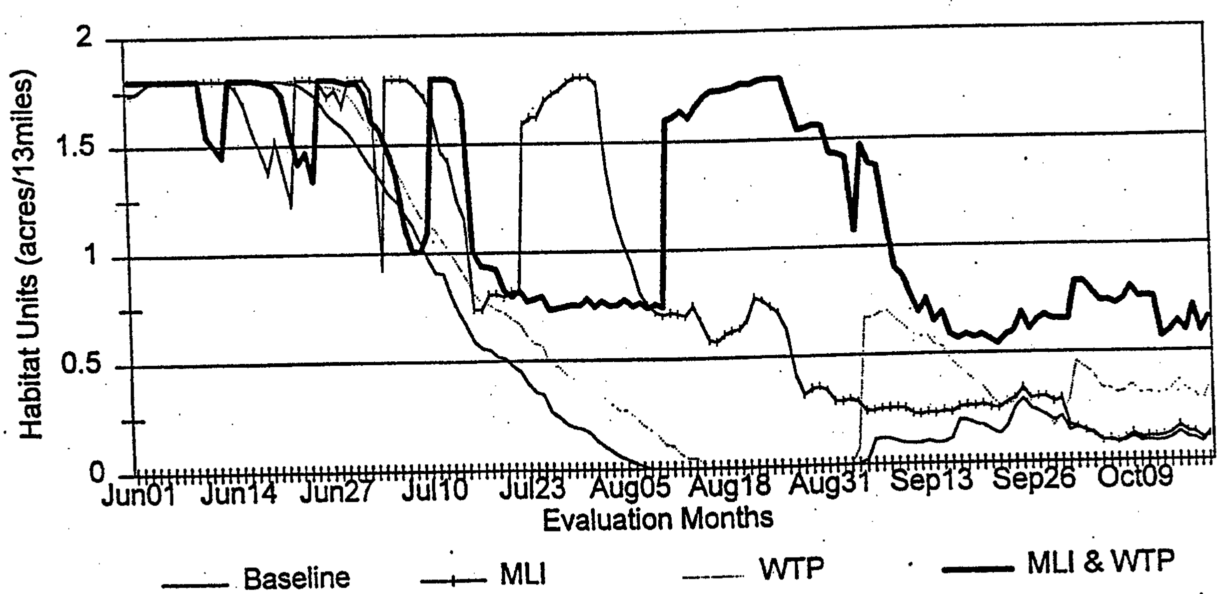
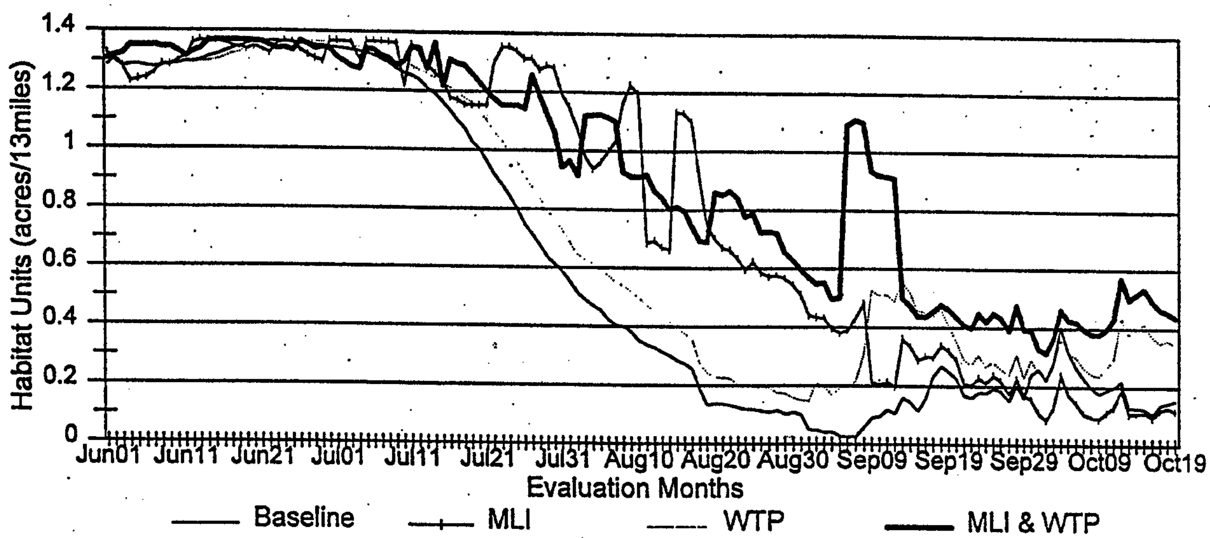


Figure 9. Total Habitat Units (acres/13miles) for adult trout below Pine Flat Dam, expressed as the weighted mean of dry, critically dry and normal year types.



minimum is still very low in summer. Extinction episodes still occur, and are substantial in length (weeks), in late August of both dry and critically dry years. In general, the WTP benefits are a consistent 0.2 HUs in the early part of the summer, attributable to the cooler water associated with the 30,000 ac-ft increase in storage during that period. Somewhat greater benefits occur in September and beyond, from 0.5-1.0 HUs above baseline, that is due to the increase in flows due to the transfer. Finally, as shown in Table 4, construction of the pipeline would consume about 0.2 acres of seasonal wetland (not analyzed by HEP), and result in a modest increase in habitat value of upland species of about 0.93 total AAHUs (Appendix C-3).

The MLI alternative has greatly improved benefits from the beginning of July-August for all of the year types, sustaining about 0.75 HUs over the baseline and WTP alternatives, with maximum benefits in August. Beginning about September 1, however, differences between the MLI and baseline are muted due to the reduction in flow at that time. Extinction episodes which were encountered in the baseline and WTP alternatives are eliminated, but the minimum habitat area from September on is about the same as, or at best slightly above, the baseline for all year types.

The combination alternative provided the greatest benefits, and most consistent benefits throughout the evaluation period. Like the MLI alternative, the combination alternative also produces the greatest benefits in July-August, at about 0.75 HUs, and has no extinction episodes. But in addition, this is the only alternative that provided significant benefits over the baseline in September-October. The combination alternative provided a consistent 0.5 HUs during this period, while the other alternatives and baseline achieved an average usable area of around 0.15-0.20 HUs. This critical difference is obviously the result of a combination of the increased storage and flows

of the WTP element, with the ability of more selective withdrawal options under the MLI element. Interestingly, habitat benefits of the combination alternative are about the same in both dry and critically dry year scenarios.

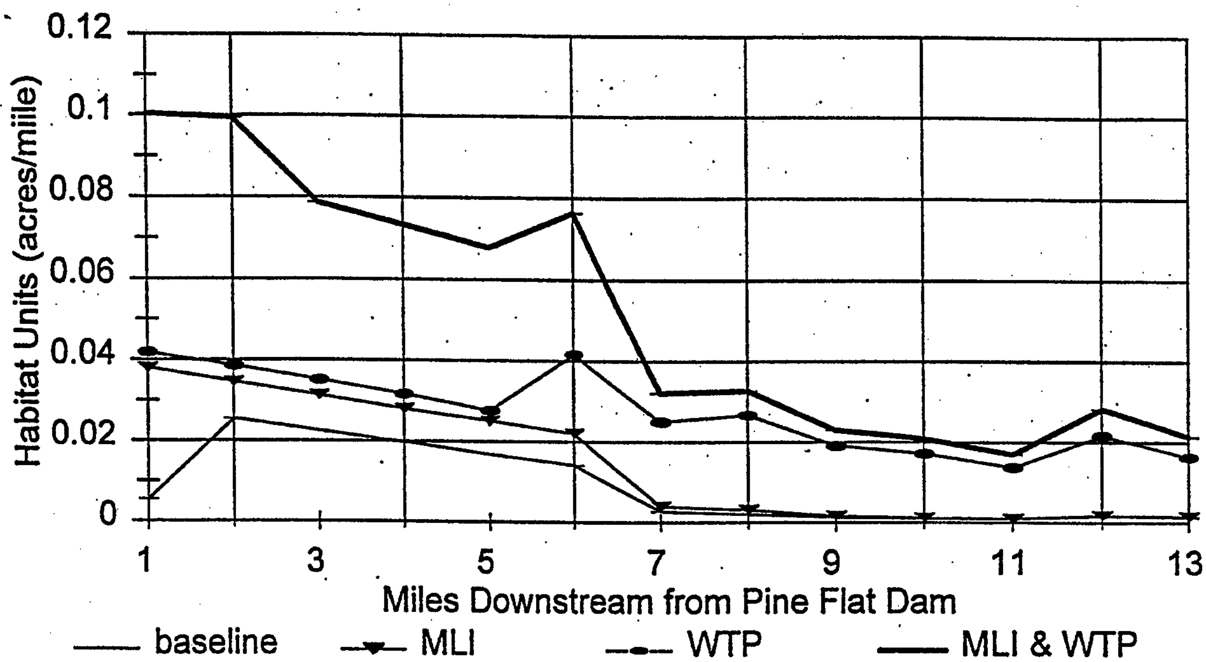
Table 4. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Restoration Plan, WTP alternative (terrestrial impacts).

COVER-TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH THE PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Seasonal wetlands	(not analyzed in HEP)	0.2	0.0	-0.2	NA	NA	NA
Annual Grassland /salt scrub	western meadow lark	5.5	+5.7	+0.2	+5.01	+4.13	-0.88
	side blotched lizard				+3.57	+3.06	-0.51
	desert cottontail				0.0	+2.32	+2.32
Totals		5.7	5.7	0	+8.58	+9.51	+0.93

The weighted average (Figure 9) illustrates annualized benefit, not taking into account the extinction episodes, and is of interest where the objective is to enhance the trout fishery in survivable years, not its long term sustainability. Benefits calculated in this way show improvement due to the WTP plan to be much more consistent, generally at least 0.1 HUs above baseline, and up to 0.3 HUs in September and October. Benefits of the MLI are greater and sustained longer, through about the beginning of September, but then are less than the WTP. But, like the individual year type approach, the weighted average still shows the greatest benefits due to the combination alternative.

To illustrate differences between alternatives in their spatial distribution of benefits, we plotted per mile benefit averaged for the post-irrigation period of September 10 - October 19 against river mile (Figure 10). Under baseline conditions, benefits are limited to the first 7 miles. The MLI plan, which results in cooler temperatures but the same flow, enhanced benefits modestly in this same 7 miles. In contrast, the WTP, which has the same temperature but at nearly twice the baseline flow, had consistent benefits throughout the entire 13 miles. The combination alternative, which has both increased flow and cooler temperature, exhibited large benefits in the first 6 miles (in excess of the sum of benefits for WTP and MLI alone), and less significant benefits in miles 7 through 13.

Figure 10. Average Habitat Units (acres/mile) for adult trout during the post-irrigation season (September 10 - October 19) of the modeled critically dry year (1992).



A more widely distributed benefit pattern is important not only because it lessens fishing pressure, but also because the ability of trout to move between sections of the lower Kings River is impaired by passage barriers.

Endangered Species Impacts: Of the species identified in Appendix A, the Fresno kangaroo rat, blunt-nosed leopard lizard, San Joaquin kit fox, and vernal pool fairy shrimp could be impacted through disturbance associated with construction of the pipeline from the WTP alternative, which transects a mosaic of terrestrial habitat types. The following discussion also would apply to the combination alternative.

The listed species are all adapted for survival in an arid environment and occupy similar habitat types. The Fresno kangaroo rat typically occupies saline sandy soils in chenopod scrub and annual grassland communities on the San Joaquin Valley floor. The blunt-nosed leopard lizard inhabits open, sparsely vegetated areas of low relief on the San Joaquin Valley floor and in the surrounding foothills. Similar to the Fresno kangaroo rat, this lizard also can inhabit valley saltbush scrub, which is a low shrubland, with an annual grassland understory. The kit fox inhabits habitat types such as hardpan vernal pool, alkali meadow, and alkali playa. Such habitat is present in limited quantity (5.5 acres) along the pipeline route, and would be adversely affected by its construction.

The vernal pool fairy shrimp inhabits vernal pools or seasonal wetlands. Pipeline construction would impact 0.2 acres of this associated habitat type.

DISCUSSION

Implicitly, the term "restoration" refers to measures taken to return a habitat or evaluation species to a condition resembling its former state and function. Clearly, the context of that term is limited for the purposes of both terrestrial and aquatic alternatives evaluated in this report. This is especially true for the lower Kings River which had previously supported a sustainable, though migratory trout fishery, as well as an extraordinary abundance of wildlife in the Tulare Lake bed. Most of the upland and wetland habitat has been converted to urban and agricultural uses, with only limited habitat in the river corridor and tailwater trout fishery that is not sustainable under the current dam configuration and operation.

If the goal of restoration of a sustainable (self-reproducing) trout fishery, the combination alternative provides the greatest and most consistent habitat benefits through the summer and fall post-irrigation period of dry and critically-dry years. The water transfer plan provides benefits, but these are insufficient to sustain the fishery through this period. The multi-level intake structure achieves greater benefits for summer only, but insufficient fall flows to sustain the habitat through the fall. The clear choice from the standpoint of sustainability is the combination alternative.

But it should also be understood that sustainability may require other measures or changes in the way the fishery is managed. Self-reproducing trout populations in the Kings River would be unlikely to endure with the impact of fishing regulations which allow high-yield take alone or in conjunction with a planting. Planting alone can have deleterious effects of competition with wild fish or induced fishing pressure, as well as transfer of disease. If intensive recreational fishing is allowed, it would have to be of a much more limited nature (e.g., catch-and-release), with no planting or a minimum of planting in areas separate from those managed for wild trout. Second, measures must be taken to ensure both the adequacy of spawning substrate, and the passage of juveniles between spawning areas and cool water refugia. As discussed above, spawning gravels have been depleted from the tailwater owing to high irrigation and sometimes, flood flows. Even if trout were to spawn successfully in the lower reaches, any juveniles attempting to find cooler water upstream would encounter a number of impassable diversions, where it would be difficult to design passage structures that would permit movement of juvenile stages. Although it may be possible to conduct a program of gravel enhancement in the upper reach, the major diversions there are unscreened, and would undoubtedly result in significant mortality of small fish. We still believe that the benefits of a combination alternative would be significant, but believe that stocking would remain necessary, albeit at a reduced level and frequency.

Faced with these caveats, and the cost of the combination alternative upwards of $80,000,000, can it be made less expensive, but achieve similar benefits as suggested in our analysis? We believe it

might. The pipeline, for example, is necessary for one of a number of variations of a water transfer plan. Other potential water transfer options, discussed in Boyle (1994), may achieve similar post-irrigation flows but not require this element. Perhaps the multi-level intake structure could be designed in a way which allows mixing of upper and lower ports, so that the number of ports and appurtenances, and associated cost, could be reduced. Finally, as we have mentioned in our earlier report (USFWS 1996), it may be possible to enlarge the coldwater reserve by rescheduling of peak operations on projects upstream of Pine Flat Lake from mid-summer to earlier in the year.

The loss of oak-riparian bottomlands in the lower Kings River and elsewhere in the State is of concern not only because of the species they support, but because these areas are a buffer to the increasing impacts of urban development, and can provide some values at the river-land interface. The proposed 56-acre restoration site is just one of a number of candidate sites in the Centerville Bottoms area; others should be studied for the potential to be acquired and restored in a similar manner.

RECOMMENDATIONS

We recommend the Corps:

1. Select the maximum alternative for the terrestrial restoration and, if constructed, the combination alternative (both water transfer plan and multi-level intake structure) for the aquatic restoration.

2. If implemented, monitor the terrestrial restoration site for a period of 20 years, consisting of plant survival and cover, and wildlife use. Monitoring and reporting should be done annually for the first five years and every fifth year thereafter.

3. Investigate alternatives to further enhance the rainbow trout fishery in the lower Kings River, including addition of spawning gravels and retention structures, provision of passage and screening at major diversions, and enhancement of riparian cover at the stream edge.

4. Complete any consultation requirements with the Service pursuant to section 7 of the Endangered Species Act.

5. Contact CDFG to determine potential project impacts to State endangered and/or threatened species.

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APPENDIX A
FEDERAL AGENCIES' RESPONSIBILITIES UNDER
SECTIONS 7(a) and (c) OF THE ENDANGERED SPECIES ACT

APPENDIX A
FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) and (c) OF THE ENDANGERED SPECIES ACT AND FEDERAL AND STATE LISTED SPECIES

SECTION 7(a) Consultation/Conference

Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species; 2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after determining the action may affect a listed species; and 3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7(c) Biological Assessment–Major Construction Activity[1]

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action[2] on listed and proposed species. The process begins with a Federal agency requesting from FWS a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the list, the accuracy of the species list should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may proceed; however, no construction may begin.

We recommend the following for inclusion in the BA: an on-site inspection of the area affected by the proposal which may include a detailed survey of the area to determine if the species or suitable habitat are present; a review of literature and scientific data to determine species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within FWS, State conservation departments, universities and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of indirect effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The BA should document the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed or proposed species would be affected. Upon completion, the BA should be forwarded to our office.

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[1] A construction project (or other undertaking having similar physical impacts) which is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332(2)C).

[2] "Effects of the action" refers to the direct and indirect effects on an action on the species or critical habitat,together with the effects of other activities that are interrelated or interdependent with that action.

ATTACHMENT A

Endangered and Threatened Species that May Occur in or be Affected by Projects in the Area of the Following California County or Counties

December 27, 1999

FRESNO COUNTY

Listed Species

Mammals

- giant kangaroo rat, *Dipodomys ingens* (E)
- Critical habitat, Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E)
- Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E)
- Tipton kangaroo rat, *Dipodomys nitratoides nitratoides* (E)
- California bighorn sheep, *Ovis canadensis californiana* (E)
- San Joaquin kit fox, *Vulpes macrotis mutica* (E)

Birds

- California condor, *Gymnogyps californianus* (E)
- Aleutian Canada goose, *Branta canadensis leucopareia* (T)
- bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

- blunt-nosed leopard lizard, *Gambelia (=Crotaphytus) sila* (E)
- giant garter snake, *Thamnophis gigas* (T)

Amphibians

- California red-legged frog, *Rana aurora draytonii* (T)

Fish

- delta smelt, *Hypomesus transpacificus* (T)
- Lahontan cutthroat trout, *Oncorhynchus (=Salmo) clarki henshawi* (T)
- Paiute cutthroat trout, *Oncorhynchus (=Salmo) clarki seleniris* (T)
- Central Valley steelhead, *Oncorhynchus mykiss* (T)
- Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

- vernal pool fairy shrimp, *Branchinecta lynchi* (T)
- valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Plants

- California jewelflower, *Caulanthus californicus* (E)
- palmate-bracted bird's-beak, *Cordylanthus palmatus* (E)
- San Joaquin woolly-threads, *Lembertia congdonii* (E)
- Hartweg's golden sunburst, *Pseudobahia bahiifolia* (E)
- Mariposa pussy-paws, *Calyptridium pulchellum* (T)
- San Benito evening-primrose, *Camissonia benitensis* (T)
- fleshy owl's-clover, *Castilleja campestris ssp. succulenta* (T)
- Hoover's eriastrum (= woolly-star), *Eriastrum hooveri* (T)

San Joaquin Valley Orcutt grass, *Orcuttia inaequalis* (T)
San Joaquin adobe sunburst, *Pseudobahia peirsonii* (T)
Greene's tuctoria, *Tuctoria greenei* (E) *

Proposed Species

Mammals

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (PE) *

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Species of Concern

Mammals

San Joaquin (=Nelson's) antelope squirrel, *Ammospermophilus nelsoni* (CA)
California wolverine, *Gulo gulo luteus* (CA)
Sierra Nevada red fox, *Vulpes vulpes necator* (CA)
pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)
Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)
short-nosed kangaroo rat, *Dipodomys nitratoides brevinasus* (SC)
spotted bat, *Euderma maculatum* (SC)
greater western mastiff-bat, *Eumops perotis californicus* (SC)
American (=pine) marten, *Martes americana* (SC)
Pacific fisher, *Martes pennanti pacifica* (SC)
small-footed myotis bat, *Myotis ciliolabrum* (SC)
long-eared myotis bat, *Myotis evotis* (SC)
fringed myotis bat, *Myotis thysanodes* (SC)
long-legged myotis bat, *Myotis volans* (SC)
Yuma myotis bat, *Myotis yumanensis* (SC)
Southern grasshopper mouse, *Onychomys torridus ramona* (SC)
Tulare grasshopper mouse, *Onychomys torridus tularensis* (SC)
San Joaquin pocket mouse, *Perognathus inornatus* (SC)
Mt. Lyell shrew, *Sorex lyelli* (SC)

Birds

Swainson's hawk, *Buteo Swainsoni* (CA)
little willow flycatcher, *Empidonax traillii brewsteri* (CA)
greater sandhill crane, *Grus canadensis tabida* (CA)
bank swallow, *Riparia riparia* (CA)
American peregrine falcon, *Falco peregrinus anatum* (D)

- northern goshawk, *Accipiter gentilis* (SC)
- tricolored blackbird, *Agelaius tricolor* (SC)
- grasshopper sparrow, *Ammodramus savannarum* (SC)
- short-eared owl, *Asio flammeus* (SC)
- western burrowing owl, *Athene cunicularia hypugea* (SC)
- American bittern, *Botaurus lentiginosus* (SC)
- ferruginous hawk, *Buteo regalis* (SC)
- Costa's hummingbird, *Calypte costae* (SC)
- Lawrence's goldfinch, *Carduelis lawrencei* (SC)
- Vaux's swift, *Chaetura vauxi* (SC)
- lark sparrow, *Chondestes grammacus* (SC)
- olive-sided flycatcher, *Contopus cooperi* (SC)
- black swift, *Cypseloides niger* (SC)
- hermit warbler, *Dendroica occidentalis* (SC)
- white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)
- Pacific-slope flycatcher, *Empidonax difficilis* (SC)
- least bittern, western, *Ixobrychus exilis hesperis* (SC)
- loggerhead shrike, *Lanius ludovicianus* (SC)
- Lewis' woodpecker, *Melanerpes lewis* (SC)
- long-billed curlew, *Numenius americanus* (SC)
- white-faced ibis, *Plegadis chihi* (SC)
- rufous hummingbird, *Selasphorus rufus* (SC)
- red-breasted sapsucker, *Sphyrapicus ruber* (SC)
- Brewer's sparrow, *Spizella breweri* (SC)
- California spotted owl, *Strix occidentalis occidentalis* (SC)
- Bewick's wren, *Thryomanes bewickii* (SC)

Reptiles

- silvery legless lizard, *Anniella pulchra pulchra* (SC)
- northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
- southwestern pond turtle, *Clemmys marmorata pallida* (SC)
- San Joaquin coachwhip (=whipsnake), *Masticophis flagellum ruddocki* (SC)
- California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

- Yosemite toad, *Bufo canorus* (SC)
- Mount Lyell salamander, *Hydromantes platycephalus* (SC)
- foothill yellow-legged frog, *Rana boylii* (SC)
- mountain yellow-legged frog, *Rana muscosa* (SC)
- western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
Kern brook lamprey, *Lampetra hubbsi* (SC)
Pacific lamprey, *Lampetra tridentata* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Ciervo aegialian scarab beetle, *Aegialia concinna* (SC)
San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)
San Joaquin dune beetle, *Coelus gracilis* (SC)
Kings Canyon cryptochian caddisfly, *Cryptochia excella* (SC)
Wooly hydroporus diving beetle, *Hydroporus hirsutus* (SC)
California linderiella, *Linderiella occidentalis* (SC)
Hopping's blister beetle, *Lytta hoppingi* (SC)
moestan blister beetle, *Lytta moesta* (SC)
molestan blister beetle, *Lytta molesta* (SC)
Morrison's blister beetle, *Lytta morrisoni* (SC)
Dry Creek cliff strider bug, *Oravelia pege* (SC)
Bohart's blue butterfly, *Philotiella speciosa bohartorum* (SC)
Sierra pygmy grasshopper, *Tetrix sierrana* (SC)

Plants.

carpenteria, *Carpenteria californica* (CA)
obovate-leaved thornmint, *Acanthomintha obovata ssp. obovata* (SC)
forked fiddleneck, *Amsinckia vernicosa var. furcata* (SC)
Bodie Hills rock-cress, *Arabis bodiensis* (SC)
Raven's milk-vetch, *Astragalus monoensis var. ravenii* (SC)
heartscale, *Atriplex cordulata* (SC)
brittlescale, *Atriplex depressa* (SC)
Lost Hills saltbush, *Atriplex vallicola* (SC)
South Coast Range morning-glory, *Calystegia collina ssp. venusta* (SC)
Mono Hot Springs evening-primrose, *Camissonia sierrae ssp. alticola* (SC)
San Benito spineflower, *Chorizanthe biloba var. immemora* (SC)
Fresno County bird's-beak, *Cordylanthus tenuis ssp. barbatus* (SC)
recurved larkspur, *Delphinium recurvatum* (SC)
mouse buckwheat, *Eriogonum nudum var. murinum* (SC)
spiny-sepaled coyote-thistle, *Eryngium spinosepalum* (SC)
hollisteria, *Hollisteria lanata* (SC)
delta tule-pea, *Lathyrus jepsonii var. jepsonii* (SC)
rayless layia, *Layia discoidea* (SC)

Panoche peppergrass, *Lepidium jaredii var. album* (SC)
long-petaled lewisia, *Lewisia longipetala* (SC)
orange lupine, *Lupinus citrinus var. citrinus* (SC)
valley sagittaria, *Sagittaria sanfordii* (SC)
parasol clover, *Trifolium bolanderi* (SC)
lesser saltscale, *Atriplex minuscula* (SC) *
pale-yellow layia, *Layia heterotricha* (SC) *

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	*Proposed Critical Habitat*	Proposed as an area essential to the conservation of the species.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	Other species of concern to the Service.
(D)	*Delisted*	Delisted. Status to be monitored for 5 years.
(CA)	*State-Listed*	Listed as threatened or endangered by the State of California.
*	*Extirpated*	Possibly extirpated from the area.
**	*Extinct*	Possibly extinct
	Critical Habitat	Area essential to the conservation of a species.

APPENDIX B
HABITAT EVALUATION PROCEDURES

PINE FLAT DAM FISH AND WILDLIFE HABITAT RESTORATION PROJECT

SUMMARY OF ALTERNATIVES

This application on Habitat Evaluation Procedures (HEP) is intended to quantify the anticipated future beneficial impacts to fish and wildlife resources that would occur with the construction of the proposed habitat restoration improvements in the vicinity of Pine Flat Dam, as part of the Pine Flat Fish and Wildlife Habitat Restoration Project. Restoration of two habitat types (oak woodland and riparian) is proposed. The restoration plan would be accomplished by planting appropriate species in an existing non-native grassland area to create oak woodland and riparian habitat. The restoration effort for each habitat type will be analyzed at three levels of intensity.

The three levels of riparian and oak woodland restoration are as follows: 1) passive riparian and oak woodland restoration consisting of fencing and placing wildlife structures; 2) a moderate level of riparian and oak woodland restoration consisting of fencing, planting, and placing wildlife structures; and (3) a maximum level of riparian and oak woodland restoration consisting of fencing, planting, placing wildlife structures, and irrigation. The HEP analysis will consider each level of restoration and will produce a measure of habitat value for each level of restoration for comparative purposes. Specific restoration components are identified below in Table B-1.

Table B-1. Specific alternative criteria for different restoration plans to be evaluated in the Pine Flat Fish and Wildlife Habitat Restoration Project.

Alternatives	Description of Action.
Alternative 1	No action to restore site. Fences will remain unrepaired.
Alternative 2	Fence riparian and oak woodland area and place wildlife structures.
Alternative 3	Fence riparian and oak woodland area, plant 900 plants per acre, no irrigation, 3 year maintenance period, and place wildlife structures.
Alternative 4	Fence riparian and oak woodland area, plant 250 plants per acre, irrigate, 5 year maintenance period, and place wildlife structures.

HEP DESCRIPTION

HEP is an impact assessment methodology developed by the Fish and Wildlife Service (Service) and other State and Federal resources agencies which can be used to document the quality and quantity of available habitat for selected wildlife species. HEP provides information for two general types of wildlife habitat comparisons: 1) the relative value of different areas at the same point in time, and 2) the relative value of the same areas at future points in time. By combining the two types of comparisons, the impacts of proposed or anticipated land and water-use changes on wildlife habitat can be quantified. In a similar manner, any compensation needs (in terms of acreage) for the project can also be quantified.

A HEP application is based on the assumption that habitat for selected wildlife species or communities can be described by a model which produces a Habitat Suitability Index (HSI). The HSI, a value from 0.0 to 1.0, is assumed to relate directly to the carrying capacity of the habitat being evaluated. The HSI is multiplied by the area of available habitat to obtain Habitat Units (HUs). Changes in habitat value and quantity are tracked over time at specified time periods known as target years (TYs). Those changes over the life of the project are annualized to yield Average Annual Habitat Units (AAHUs). The life of the project is based upon a 50-year period. The period of analysis is equal to the life of the project plus any construction period. The difference in AAHUs for various project scenarios permit comparison of alternatives.

Impacts associated with each future scenario are evaluated for a number of target years. To predict changes in a HSI for each future scenario, it is necessary to make assumptions regarding baseline and future values within project impact and compensation areas. These assumptions are listed in HEP Appendix B-1. Given these assumptions, long-term losses and gains in HUs can then be estimated for each future scenario over the life of the project, then expressed as AAHU gains or losses. The reliability of a HEP application, including the significance of HUs and AAHUs is directly dependent on the ability of the HEP user(s) to assign a well-defined and accurate HSI to the selected evaluation species or communities. Also, the HEP user(s) must be able to identify and measure (or predict) the area of each distinct habitat that is utilized by fish and wildlife within the project impact area. Both the HSIs and the habitat acreage must also be reasonably estimable at various future points in time. The SIs and HSIs calculated from baseline and future assumptions are given in HEP Appendix B-2. HEP results are shown in HEP Appendix B-3.

A fundamental and critical step in designing any HEP application is the setting of overall goals and objectives. In this HEP application, such goals and objectives were developed based on the overall, long-term resource management goals of the Service.

The following goals and objectives were established for the HEP used in this study:

1. The primary goal was to evaluate the impacts (benefits) on wildlife from the proposed restoration plan.

2. Quantify habitat conditions before project construction.

3. Quantify habitat condition after project construction.

HSI MODEL SELECTION

Construction of the project would impact annual grassland, and create riparian and oak woodland habitat. HSI models were selected to evaluate the changes in habitat value over the life of the project. Each model contains specific habitat variables that, when measured, result in a relative numeric value of the habitat type the models utilize. As restoration measures are implemented and the habitats are changed or enhanced, the future results of the HEP model variables may increase or decrease depending on benefits or impacts from the proposed restoration work.

Discussed below are the species selected to evaluate the habitat affected and the reasons why they were selected. Habitat variables for each model are listed in Table B-2. The walnut orchard was not analyzed in the HEP because the proposed riparian plantings would offset impacts to the orchard. Annual grassland habitat was also not evaluated in this report because it could be mitigated by reseeding disturbed sections of the project area with an appropriate native grass seed mix.

The yellow warbler HSI model (Schroeder 1982) was selected for the riparian habitat because: (1) the species prefers areas that are wet with abundant shrubs or small trees; (2) they inhabit hedgerows, thickets, marshes, and woody wetland areas, and (3) the Service had developed a model for the species which had been used and accepted by various State and Federal resource agencies in the past.

The gray fox HSI Model (Keck 1989) was selected for use in both the riparian and oak woodland habitat because: (1) the species prefers brushy vegetation interspersed with rugged broken terrain; (2) the species occupies a variety of habitats, and (3) the Service had developed a model for the species which had been used and accepted by various State and Federal resource agencies in the past. Variable 2 was not be evaluated because it pertains to different habitat types (oak savannah and irrigated agriculture).

The plain titmouse HSI model (Long 1989) was selected for oak woodland habitat type, because (1) the titmouse is primarily a bark forager and is highly associated with oak and pinyon-juniper woodlands, and (2) the Service had developed a model for the species which had been used and accepted by various State and Federal resource agencies in the past.

METHODOLOGY

The 1980 HEP procedures were used in this application which was conducted on August 19, 1997. Participants in the data collection portion of the HEP were representatives from the Service (Brian Cordone) and Kings River Conservation District (Jeff Halstead, Craig Kindlin, Jeff Swindle). Staff from the Department of Fish and Game was invited to participate, but were unable to attend.

The capacity of each sample site to meet the needs of the habitat within the project impact were determined by the HEP team through a combination field measurement of specific habitat variables, and assumptions based on biological knowledge. A HSI was then manually calculated for each habitat, yielding a rating on a scale of 0.0 to 1.0, with higher numerical ratings indicative of a higher value habitat. Table B-2 presents the evaluation species, variable descriptions, habitats measured, and methods used to obtain a value for each variable.

In order to make comparisons of no action and the three levels of restoration intensity for oak woodland and riparian habitat, specific management actions were developed. The management plans included features such as fencing, varying levels of plantings, irrigation versus no irrigation, varying maintenance periods, and placement of wildlife structures. The management plans for the two habitats proposed for restoration are summarized in Table B-1.

Table B-2. Evaluation species, variable description, applicable habitat, and method used to obtain the values for each HSI species model variable for the proposed restoration improvements to the Pine Flat Fish and Wildlife Habitat Restoration Project.

Evaluation Species	Variable Description	Habitat	Method Used
Yellow Warbler	V1-% deciduous shrub crown cover.	Riparian	Spherical densiometer
	V2-Average height of deciduous shrub canopy.	Riparian	Line intercept (1 m^2 quadrat)
	V3-% of deciduous shrub canopy comprised of hydrophytic shrubs.	Riparian	Spherical densiometer
Plain Titmouse	V1-tree diameter	Oak woodland	Line intercept (1 m^2 quadrat)
	V2-trees per acre	Oak woodland	Ocular estimate
	V3-% Oak trees	Oak woodland	Ocular estimate
Gray Fox	V1-% herbaceous cover	Riparian/Oakwoodland	Line intercept (1 m^2 quadrat)
	V2-Distance to cover (not used because of habitat type)	Not used	Not used
	V3-Density of shrub/under story (%)	Riparian/Oakwoodland	Line intercept (1 m^2 quadrat)
	V4-# of suitable den sites	Riparian/Oakwoodland	Ocular estimate

RESULTS AND DISCUSSION

Under the no action management plan, the 56 acres under consideration for restoration would be left in its present condition. The grassland would continue to be grazed at levels done in the past, and the area would continue to exhibit low habitat value. The regeneration of oaks and other riparian species would be minimal, if not non-existent.

Through the HEP analysis (Appendices B1-B3) quantitative habitat values termed Average Annual Habitat Units (AAHUs) were calculated for each management plan. As shown in table B-3 through B-8, each management plan yielded a positive net change in AAHUs. The greatest benefits for both riparian and oak woodland habitat restoration would be accomplished by constructing Alternative 4.

However, these initial determinations do not take into account costs for implementation or operation and maintenance. These factors will also influence the decisions on which management plan(s) are pursued.

Table B-3. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Restoration Plan, Alternative 2.

COVER-TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH-THE-PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Riparian	Gray fox	0.0	30	+30	11.29	20.05	+8.76
	Yellow warbler				0.0	4.53	+4.53
Annual Grassland	(not analyzed in HEP)	56	0	-56	NA	NA	NA
Oak woodland	Plain Titmouse	0.0	26	+26	1.8	5.73	+3.93
	Gray fox				6.44	12.08	+5.64
Totals		56	56	0	19.53	42.39	+22.86

The associated data values used in determining the benefits for Alternative 2 are identified below in Table B-4.

Table B-4. HSIs and acreage for the cover-types for all years for future conditions without the project (TY 0) and future conditions with the project (TYs 1-51) for Alternative 2 for the Pine Flat Fish and Wildlife Watershed Restoration Plan.

SPECIES MODEL/ COVER-TYPE	TY 0		TY 1		TY 5		TY 20		TY 51	
	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI
Gray fox/ Riparian	0.0	0.38	30	0.68	30	0.65	30	0.65	30	0.73
Yellow warbler/ Riparian	0.0	0.0	30	0.0	30	0.0	30	0.2	30	0.2
Gray fox/Oak Woodland	0.0	0.25	26	0.43	26	0.53	26	0.53	26	0.35
Plain titmouse/Oak woodland	0.0	0.07	26	0.07	26	0.07	26	0.27	26	0.27

Table B-5. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Restoration Plan, Alternative 3.

COVER TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH THE PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Riparian	Gray fox	0.0	30	+30	11.29	27.33	+16.04
	Yellow warbler				0.0	22.74	+22.74
Annual Grassland	(not analyzed in HEP)	56	0	-56	NA	NA	NA
Oak woodland	Plain Titmouse	0.0	26	+26	1.8	9.69	+7.89
	Gray fox				6.44	17.62	+11.18
Totals		56	56	0	19.53	77.38	+57.85

The associated data values used in determining the benefits for Alternative 3 are identified below in Table B-6.

Table B-6. HSIs and acreage for the cover-types for all years for future conditions without the project (TY 0) and future conditions with the project (TYs 1-51) for Alternative 3 for the Pine Flat Fish and Wildlife Watershed Restoration Plan.

SPECIES MODEL/ COVER TYPE	TY 0		TY 1		TY 5		TY 20		TY 51	
	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI
Gray fox/ Riparian	0.0	0.38	30	0.75	30	0.85	30	0.93	30	0.93
Yellow warbler/ Riparian	0.0	0.0	30	0.19	30	0.28	30	0.43	30	0.46
Gray fox/Oak Woodland	0.0	0.25	26	0.55	26	0.7	26	0.63	26	0.78
Plain titmouse/Oak woodland	0.0	0.07	26	.07	26	0.07	26	0.52	26	0.4

Table B-7. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Restoration Plan, Alternative 4.

COVER TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH THE PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Riparian	Gray fox	0.0	30	+30	11.29	20.05	+8.76
	Yellow warbler				0.0	22.75	+22.75
Annual Grassland	(not analyzed in HEP)	56	0	-56	NA	NA	NA
Oak woodland	Plain Titmouse	0.0	26	+26	1.8	17.5	15.7
	Gray fox				6.44	24.26	+17.82
Totals		56	56	0	19.53	84.56	+65.03

The associated data values used in determining the benefits for Alternative 4 are identified below in Table B-8.

Table B-8. HSIs and acreages for the cover-types for all years for future conditions without the project (TY 0) and future conditions with the project (TYs 1-51) for Alternative 4 for the Pine Flat Fish and Wildlife Watershed Restoration Plan.

SPECIES MODEL / COVER-TYPE	TY 0		TY 1		TY 5		TY 20		TY 51	
	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI
Gray fox/ Riparian	0.0	0.38	30	0.75	30	0.93	30	0.93	30	0.93
Yellow warbler/ Riparian	0.0	0.0	30	0.5	30	0.63	30	0.77	30	0.89
Gray fox/Oak Woodland	0.0	0.25	26	0.70	26	0.78	26	1.0	26	1.0
Plain titmouse/Oak woodland	0.0	0.07	26	0.07	26	0.07	26	0.87	26	0.87

LITERATURE CITED

JSA (Jones & Stokes Associates). 1997. Friant-Kern Canal Restoration Site Fresno County, California. Site Conditions and Preliminary Conceptual Alternatives for Restoration.

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HEP APPENDIX B-1
ASSUMPTIONS USED IN PREDICTING FUTURE SCENARIOS

HEP APPENDIX B-1
ASSUMPTIONS USED IN PREDICTING FUTURE SCENARIOS FOR THE PINE FLAT FISH AND WILDLIFE HABITAT RESTORATION PROJECT HEP

General

1. HEP is a suitable methodology for quantifying project impacts to fish and wildlife.

2. Construction time will only take one year to complete restoration actions.

3. Alternatives were based on Jones and Stokes Associate's report, Site Conditions and Preliminary Conceptual Alternatives for Restoration, July 8, 1997.

4. Year 50 was considered to be near the reference site conditions if not better, because grazing would no longer be allowed.

Future without the Project (Impact Area)

1. Existing habitat in impact area is grassland.

2. Future land uses would not change from current use.

Future with the Project (Impact Area)
OAK WOODLAND HABITAT

1. Percentage of oak planting will optimize HSI model by planting 70-100% for Alternative 3 and 4.

2. Even though tree plantings were not considered trees until year 20, percentages of oak trees planted (70-100%) were still generated to optimize HSI model (V3 titmouse) for years 20 and after.

3. Trees per acre (V2 titmouse) are assumed to optimize model variable by planting from 60-100 trees per acre for Alternative 3 and 4.

4. By year 20, restoration site should be nearing reference site conditions for both riparian and oak woodland habitat types.

5. Under Alternative 3, during years 1-3, the site will loose 60% of the plantings each year. The difference will be replanted through year 3. 60% of those planted would be lost and not replanted (ie, 40% survival after 3 years).

6. Under Alternative 4, there will be a 20% mortality rate every 5 years.

RIPARIAN

1. Under Alternative 3, during years 1-3, the site will lose 50% of the plants each year. The difference would be replanted through year 3.

2. Under Alternative 4 there will be a loss of 20% of the plantings every 5 years.

Evaluation Species Selection

1. The species selected are good representatives of the habitat quality per each habitat, and the changes in habitat quality relate to each evaluation species.

2. The species selected are sufficient to gauge the extent of impacts from the project.

Field Data Collection

1. The methods used to select sample sites were sufficiently random for the purposes of this study.

HEP APPENDIX B-2
DATA ANALYSIS ASSUMPTIONS

HEP APPENDIX B-2
DATA ANALYSIS ASSUMPTIONS FOR THE PINE FLAT FISH AND WILDLIFE HABITAT RESTORATION HEP

1. RIPARIAN HABITAT MODELS AND CALCULATIONS

I. <u>ALTERNATIVE 2, 30 ACRES RIPARIAN AND 26 ACRES OAK WOODLAND.</u>

Yellow Warbler (Riparian)
Variables:

V1-% deciduous shrub crown cover.
V2-Average height of deciduous shrub canopy.
V3-% of deciduous shrub canopy comprised of hydrophytic shrubs.

HSI Calculation: $(V1*V2*V3)^{1/3}=$

Gray Fox (Riparian)
Variables:

V1-% herbaceous cover
V2-Distance to cover (not used because of habitat type)
V3-Density of shrub/under story (%)
V4-Number of suitable den sites

Sifood=V1
SIcover/reproduction=(V3+V4)/2
HSI Calculation: (SIfood+SIcover/reprod.)/2

1a. Riparian Habitat-Alternative 2, Without Project warbler

Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.

TY 0 Baseline conditions. Riparian habitat 0 acres.

V1-0%	SI= 0.0	
V2-0.0	SI= 0.0	$HSI=(V1*V2*V3)^{1/3}=0.0$
V3-0%	SI= 0.1	

TY 1-51 No change from TY 0.

1b. Riparian Habitat-Alternative 2, Without Project fox

Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Assume baseline conditions.

For TY 0-51 same results, Riparian Habitat 0 acres.

V1-50%	SI=0.75	Sifood=V1
V3-4%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-0.0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.38

1c. Riparian habitat-Alternative 2, With Project warbler

TY 0 same as baseline conditions. Riparian habitat 0 acres.

TY 1, Riparian habitat, 30 acres.
Assume natural regeneration due to the cessation of grazing.

V1-10%	SI=0.15	
V2-0.1	SI=0.05	HSI=(V1*V2*V3)$^{1/3}$ =0.0
V3-5%	SI=0.0	

TY 5, Riparian habitat, 30 acres.

V1-25%	SI=0.4	
V2-0.4	SI=0.0	HSI=(V1*V2*V3)$^{1/3}$ =0.0
V3-12%	SI=0.2	

TY 20, Riparian habitat, 30 acres.

V1-38%	SI=0.6	
V2-0.6	SI=0.3	HSI=(V1*V2*V3)$^{1/3}$ =0.23
V3-25%	SI=0.3	

TY 51 same as TY 20

1d. Riparian habitat-Alternative 2, With Project fox

Assume wildlife structures placed are adequate den sites.
TY 0 Same as baseline conditions

TY 1, Riparian habitat, 30 acres.

V1-66%-100%	SI=1.0	SIfood=V1
V3-4%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.68

Assume trees and shrubs start to shade out ground cover and reduce percentage of herbaceous cover.
Assume shrubs establish and increase percent of understory.

TY 5 and 20, Riparian habitat, 30 acres.

V1-55%	SI=0.8	SIfood=V1
V3-25%	SI=0.3	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.65

TY 51, Riparian habitat, 30 acres.

V1-55%	SI=0.8	SIfood=V1
V3-35%	SI=0.6	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.73

II. ALTERNATIVE 3, 30 ACRES RIPARIAN AND 26 ACRES OAK WOODLAND.

2a. Riparian Habitat-Alternative 3, Without Project warbler

Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.

TY 0 Baseline conditions. Riparian habitat, 0 acres.

V1-0%	SI= 0.0	
V2-0.0	SI= 0.0	HSI=(V1*V2*V3)^⅓ =0.0
V3-0%	SI= 0.1	

TY 1-51 No change from TY 0.

2b. Riparian Habitat, Alternative 3, Without Project fox

Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Assume baseline conditions.

For TY 0-51 same results, Riparian Habitat 0 acres.

V1-50%	SI=0.75	Sifood=V1
V3-4%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-0.0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.38

2c. Riparian Habitat, Alternative 3, With Project warbler

TY 0, Same as baseline conditions. Riparian habitat, 0 acres.

Assume plantings are done to maximize warbler model.
TY 1, Riparian habitat, 30 acres.

V1-15%	SI=0.25	
V2-0.3	SI=0.15	HSI=(V1*V2*V3)^⅓ =0.19
V3-100%	SI=1.0	

TY 5, Riparian habitat, 30 acres.

V1-25%	SI=0.4	
V2- 0.5	SI=0.25	HSI=(V1*V2*V3)^⅓=0.28
V3-75%	SI=0.8	

Assume die off of hydrophitic plants after maintenance period.
TY 20, Riparian habitat, 30 acres.

V1-45%	SI=0.7	
V2- 0.85	SI=0.45	HSI=(V1*V2*V3)^⅓ = 0.43
V3- 60%	SI=0.6	

TY 51, Riparian habitat, 30 acres.

V1- 50%	SI=0.8	
V2-1	SI=0.45	HSI=(V1*V2*V3)^⅓=0.46
V3- 60%	SI=0.6	

2d. Riparian Habitat, Alternative 3, With Project fox
TY 0 same as baseline conditions. Riparian Habitat 0 acres.
Assume planting scheme maximizes model.

TY 1, Riparian habitat, 30 acres.

V1-66-100%	SI=1.0	SIfood=V1
V3-25%	SI=0.3	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.75

Assume shrubs establish and form greater percentage of understory.
TY 5, Riparian habitat, 30 acres.

V1-66-100%	SI=1.0	SIfood=V1
V3-40%	SI=0.7	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.85

TY 20,51, Riparian habitat, 30 acres.

V1-66-100%	SI=1.0	SIfood=V1
V3-50-100%	SI=1.0	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.93

III. ALTERNATIVE 4, 30 ACRES RIPARIAN AND 26 ACRES OAK WOODLAND.

3a. Riparian Habitat, Alternative 4, Without Project warbler
Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.

TY 0, Baseline conditions. Riparian habitat 0 acres.

V1-0%	SI= 0.0	
V2-0.0	SI= 0.0	HSI=(V1*V2*V3)$^{1/4}$ =0.0
V3-0%	SI= 0.1	

TY 1-51, No change from TY 0.

3b. Riparian Habitat, Alternative 4, Without Project fox
Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Assume baseline conditions.

For TY 0-51 same results, Riparian Habitat 0 acres.

V1-50%	SI=0.75	Sifood=V1
V3-4%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-0.0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.38

3c. Riparian Habitat, Alternative 4, With Project warbler
Assume this management plan is nearing reference site conditions by TY 51.
Assume plantings maximize model.
Assume die off of hydrophytic shrubs after maintenance period.

TY 0 Same as baseline.

TY 1, Riparian habitat, 30 acres.

V1-60-80%	SI=1.0	
V2-0.5	SI=0.25	HSI=$(V1*V2*V3)^{1/2}$=0.50
V3-100%	SI=1.0	

TY 5, Riparian habitat, 30 acres.

V1-60-80%	SI=1.0	
V2-0.9	SI=0.4	HSI=$(V1*V2*V3)^{1/2}$=0.63
V3-100%	SI=1.0	

TY 20, Riparian habitat, 30 acres.

V1-60-80%	SI=1.0	
V2-1.4	SI=0.7	HSI=(V1*V2*V3)½=0.77
V3-85%	SI=0.85	

TY 51, Riparian habitat, 30 acres.

V1-	60-80%	SI=1.0	
V2-	2.0	SI=1.0	HSI=$(V1*V2*V3)^{1/2}$=0.89
V3-	75%	SI=0.8	

3d. Riparian Habitat, Alternative 4, With Project fox
TY 0 same as baseline conditions.

TY 1, Riparian habitat, 30 acres.

V1-66-100%	SI=1.0	SIfood= V1
V3-25%	SI=0.3	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.75

Assume shrubs begin to establish and with irrigation can achieve a higher V3.
TY 5, 20, 51, Riparian habitat, 30 acres.

V1-66-100%	SI=1.0	SIfood=V1
V3-60-100%	SI=1.0	SIcover/reproduction= (V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.93

2. OAK WOODLAND HABITAT MODELS AND CALCULATIONS

IV. ALTERNATIVE 2. 30 ACRES RIPARIAN AND 26 ACRES OAK WOODLAND.

Gray Fox (Oak Woodland)
Variables:
V1-% herbaceous cover
V2-Distance to cover (not used because of habitat type)
V3-Density of shrub/understory (%)
V4-Number of suitable den sites

Sifood=V1
SIcover/reproduction=(V3+V4)/2
HSI Calculation: (SIfood+SIcover/reprod.)/2

Plain Titmouse (Oak Woodland)

Variables:

V1-Tree diameter
V2-Trees per acre
V3-% Oak trees

HSI Calculation: (V1+V2+V3)/3

4a. Oak Woodland Habitat, Alternative 2, Without Project fox

Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Assume baseline conditions
TY 0-51, Oak Woodland, 0 acres.

V1-35%	SI=0.5	SIfood=V1
V3-0%	SI=0.0	SIcover/reproduction= (V3+V4)/2
V4-0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.25

4b. Oak Woodland Habitat, Alternative 2, Without Project titmouse

Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Results for TY 0-51. Oak Woodland Habitat, 0 acres.
Baseline.

V1-	0.0	SI=0.2	
V2-	0.0	SI=0.0	HSI=(V1+V2+V3)/3=0.07
V3-	0.0	SI=0.0	

4c. Oak Woodland Habitat, Alternative 2, With Project fox

TY 0 Same as baseline conditions.

TY 1, Oak Woodland, 26 acres.

V1-35%	SI=0.5	SIfood=V1
V3-0%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.43

Assume with cessation of grazing more ground cover is produced.
TY 5,20, Oak Woodland, 26 acres.

V1-40%	SI=0.6	SIfood=V1
V3-20%	SI=0.2	SIcover/reproduction= (V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.53

Assume suitable densities are no longer useable due to organic breakdown.
TY 51, Oak Woodland, 26 acres.

V1-40%	SI=0.6	SIfood=V1
V3-20%	SI=0.2	SIcover/reproduction=(V3+V4)/2
V4-0.0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.35

4d. Oak Woodland Habitat, Alternative 2, With Project titmouse

TY 0,1,5 Same as baseline conditions.

Assume natural regeneration.

TY 20	V1-0-6"	SI=0.2	
TY 51	V2-10	SI=0.3	HSI=(V1+V2+V3)/3=0.27
	V3-20%	SI=0.3	

V. **ALTERNATIVE 3. 30 ACRES RIPARIAN AND 26 ACRES OAK WOODLAND.**

5a. Oak Woodland Habitat, Alternative 3, Without Project fox
Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Assume baseline conditions
TY 0-51, Oak Woodland, 0 acres.

V1-35%	SI=0.5	SIfood=V1
V3-0%	SI=0.0	SIcover/reproduction= (V3+V4)/2
V4-0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.25

5b. Oak Woodland Habitat, Alternative 3, Without Project titmouse
Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Results for TY 0-51. Oak Woodland Habitat, 0 acres.
Baseline.

V1-0.0	SI=0.2	
V2-0.0	SI=0.0	HSI=(V1+V2+V3)/3=0.07
V3-0.0	SI=0.0	

5c. Oak Woodland Habitat Alternative 3, With Project fox
TY 0 Same as baseline conditions.

TY 1, Oak Woodland Habitat, 26 acres.

V1-40%	SI=0.6	SIfood=V1
V3-25%	SI=0.3	SIover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.55

Assume shrubs establish.
TY 5, Oak Woodland Habitat, 26 acres.

V1-50%	SI=0.75	SIfood=V1
V3-35%	SI=0.6	SIover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.70

Assume plantings done to maximize model. Wildlife structures break down.
TY 20, Oak Woodland Habitat, 26 acres.

V1-60%	SI=0.9	SIfood=V1
V3-40%	SI=0.7	SIcover/reproduction=(V3+V4)/2
V4-0.0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.63

Assume mortality of plants cause reduction of ground cover. Mortality cause new den sites to form.
TY 51, Oak Woodland Habitat, 26 acres.

V1-50%	SI=0.7	SIfood=V1
V3-50-100%	SI=1.0	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.78

5d. Oak Woodland Habitat, Alternative 3, With Project titmouse
TY 0-5 same as baseline
Assume planting will maximize model.
Assume trees are not considered trees till TY20.
TY 20, Oak woodland, 26 acres.

V1-6-24"	SI=0.6	
V2-30	SI=0.45	HSI=(V1+V2+V3)/3=0.52
V3-20%	SI=0.5	

Assume mortality causes reduction in number.
TY 51, Oak woodland, 26 acres.

V1-6-24"	SI=0.6	
V2-20	SI=0.3	HSI=(V1+V2+V3)/3=0.40
V3-20%	SI=0.3	

VI. PINE FLAT, ALTERNATIVE 4, HIGH LEVEL OF RESTORATION, 30 ACRES RIPARIAN AND 26 ACRES OAK WOODLAND.

6a. Oak Woodland Habitat, Alternative 4, Without Project fox
Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Assume baseline conditions
TY 0-51, Oak Woodland, 0 acres.

V1-35%	SI=0.5	SIfood=V1
V3-0%	SI=0.0	SIcover/reproduction= (V3+V4)/2
V4-0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.25

6b. Oak Woodland Habitat, Alternative 4, Without Project titmouse
Assume management practices for the land do not change. Therefore, the value of the area in the future will be the same as the base line conditions.
Results for TY 0-51. Oak Woodland Habitat, 0 acres.
Baseline.

V1-0.0	SI=0.2	
V2-0.0	SI=0.0	HSI=(V1+V2+V3)/3=0.07
V3-0.0	SI=0.0	

6c. Oak Woodland Habitat, Alternative 4, With Project fox
TY 0, Same as baseline.

V1-35%	SI=0.5	SIfood=V1
V3-0%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-0.0	SI=0.0	HSI=(SIfood+SIcover/reprod.)/2=0.25

Assume structures are placed and shrubs begin to establish.
TY 1, Oak woodland, 26 acres.

V1-44%	SI=0.9	SIfood=V1
V3-25%	SI=0.3	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.7

TY 5, Oak woodland, 26 acres.

V1-44%	SI=0.9	SIfood=V1
V3-35%	SI=0.6	SIcover/reproduction=(V3+V4)/2
V4-1-2	SI=0.7	HSI=(SIfood+SIcover/reprod.)/2=0.78

Mortality cause more den sites to form.
Assume healthy functioning ecosystem with replacement of lost plants.
TY 20, Oak woodland, 26 acres.

V1-66-100%	SI=1.0	SIfood=V1
V3-42%	SI=0.0	SIcover/reproduction=(V3+V4)/2
V4-3+	SI=1.0	HSI=(SIfood+SIcover/reprod.)/2=1.0

TY 51, Oak woodland, 26 acres.

V1-66-100%	SI=1.0	SIfood=V1
V3-50-100%	SI=1.0	SIcover/reproduction=(V3+V4)/2
V4-3+	SI=1.0	HSI=(SIfood+SIcover/reprod.)/2=1.0

6d. Oak Woodland Habitat, Alternative 4, With Project titmouse
TY 0-5 same as baseline conditions.

Assume planting will maximize model.
Assume trees are not considered trees till TY20.
TY 20, 51, Oak woodland, 26 acres.

V1-6-24"	SI=0.6	
V2-60-100	SI=1.0	HSI=(V1+V2+V3)/3=0.87
V3-70-100	SI=1.0	

HEP APPENDIX B-3
HABITAT SUITABILITY INDEX MODELS

HABITAT SUITABILITY INDEX MODEL
Gray Fox (*Urocyon cinereoargenteus*)

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March 1989

INTRODUCTION

The gray fox (*Urocyon cinereoargenteus*) occurs throughout most of the U. S. except the interior northwest and Rocky Mountains; it also occurs south throughout most of South America (Carey, 1982; Jameson, 1988). The gray fox is the most common and widespread fox in California, occurring at low to middle elevations (rarely above 5,000 feet) throughout most of the state. Home range sizes are highly varied, from 74 acres (30 hectares) in California to 6,808 acres in Alabama. Studies from Utah and California report home ranges not greater than 494 acres (Fritzell, 1988).

Gray foxes are very cosmopolitan in terms of habitat preference. They are reported to occupy a wide array of habitats, preferring areas of interspersion. In western North America, they favor brushy vegetation interspersed with rugged, broken terrain or riparian forest interspersed with agricultural lands. (Kucera, 1982; Hallberg and Trapp, 1984). Generally, they prefer shrub or brush land (Trapp, Schmidt, pers. comm.) and early successional stages of forest habitats (Carey, 1982).

Gray foxes are omnivorous and highly opportunistic. Diet varies regionally and is dependent on the seasonal availability of food sources. Food items include small mammals, birds, reptiles, amphibians, invertebrates, carrion, vegetation, fruit and grain (Carey, 1982; Fritzell, 1988). Rodents and lagomorphs appear to be the most common food item in the diets of the gray fox in California (Grinell, et. al., 1937) but insects and fruits are also of major importance. Studies in Zion National Park, Utah, show that gray foxes are first and foremost insectivores and frugivores (Trapp, pers. Comm.). Their ability to climb trees gives the gray fox a wider array of food sources than most other species of fox. Gray fox may become more frugivorous and herbivorous in the fall and winter, as the availability of prey species decreases.

MODEL APPLICABILITY

This model is designed for use in the Central Valley of California and surrounding foothills at elevations up to approximately 1,500 feet.

HSI MODEL

Habitat Type	Life Requisite	Spatial Variable	Variable
Oak Savannah (OS)	Food		(V_1) % herbaceous cover
Irrigated Agriculture (IA)	Cover/ Reproduction		(V_2) distance to cover
Oak Woodland (OW)	Food		(V_1) % herbaceous cover
Riparian Forest (RF)	Cover/		(V_3) % shrub/Understory
Reproduction			(V_4) # suitable den sites

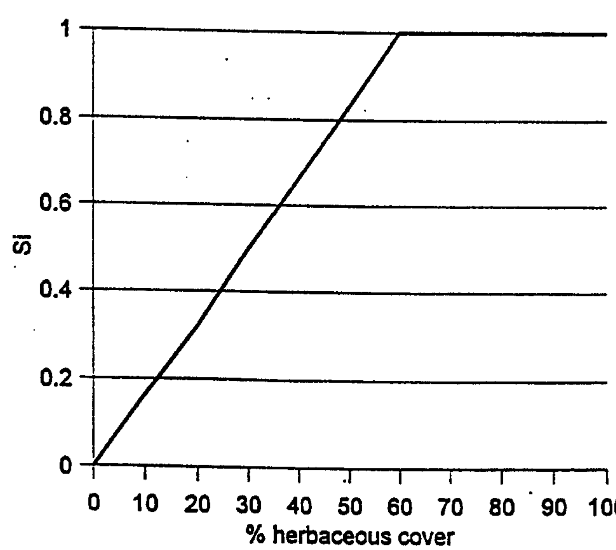
Assumptions:

1) Oak savannah and irrigated agriculture are used primarily as foraging habitat. Overall habitat suitability for these two habitats depends on proximity to cover/reproduction areas.

2) Oak woodland, riparian forest and scrub habitats provide all of the habitat features necessary for all life requisites.

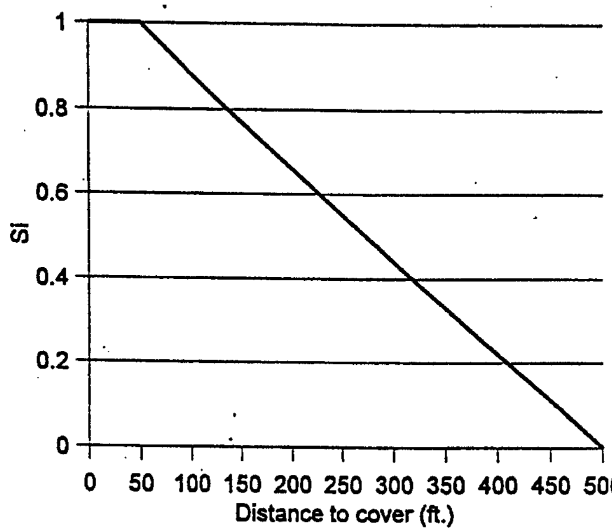
Variable	Habitat Type	Suggested Sampling Technique
(V_1) % herbaceous cover	OS, IA, OW, RF, SC	Line intercept
(V_2) distance to cover	OS, IA	Aerial photo interpretation
(V3) % shrub/ understory	OW, IA, SC	Line intercept
(V_4) # of suitable den sites	OW, IA, SC	Visual estimate

Variable 1: Percent herbaceous cover
Assumptions:
1) Herbaceous cover is an essential habitat component for prey species (small mammals).
2) Optimum habitat conditions for prey species require 66% herbaceous cover (U.S. Fish and Wildlife Service, 1984).

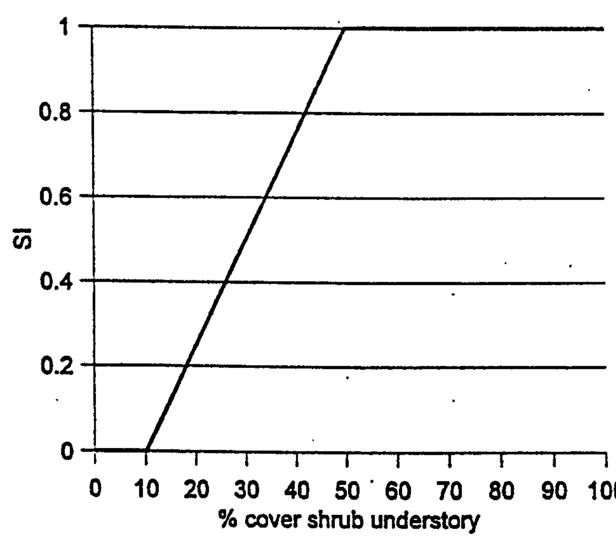


Variable 2: Distance to cover
Assumptions:
1) Optimum habitat for gray fox is composed of areas which provide both forage and cover. Gray foxes do not venture far from cover. Overall habitat suitability requires that distance to cover areas be no greater than 0.1 mile (~500 feet) (Trapp, pers. comm). Cover within about approximately 50 feet is optimum.

2) Overall habitat value decreases as the distance between cover and foraging areas increases.



Variable 3: Density of the shrub understory (% cover)
Assumptions:
1) Shrub cover greater than 50% provides optimum habitat for resting and cover. Less than 10% cover is not suitable gray fox habitat (California Department of Fish and Game, 1988).
2) A shrub is defined in this model as a woody plant species less than 16 feet in height.

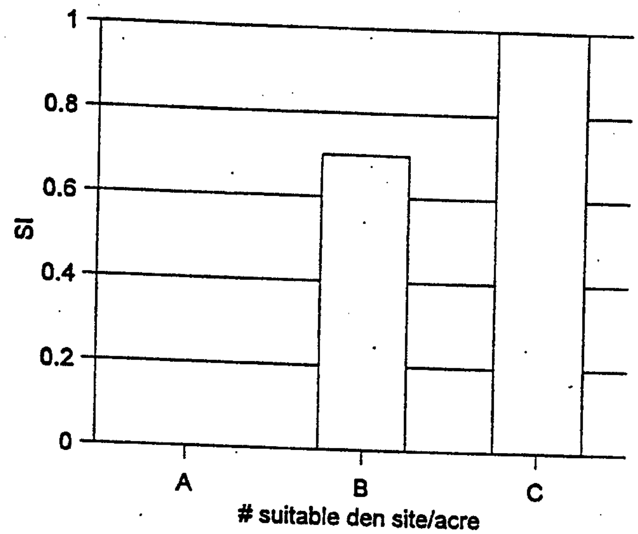


Variable 4: Number of suitable den sites/acre

A) No suitable den sites available.

B) 1-2 den sites available.

C) 3 or more suitable den sites available.



Assumption:

1) Suitable den sites include hollow logs, rock piles, brush piles, crevices in cliffs, and abandoned burrows.

Equations used to calculate HSI values:

Habitat Type	Component	Equation
OS, IA	food, cover/reproduction	$HSI = \frac{V_1 + V_2}{2}$
OW, RF, SC	food	$Si_{food} = V1$
	Cover/reproduction	$Si_{cover/reproduction} = \frac{V_3 + V_4}{2}$

$$HSI = \frac{Si_{food} + Si_{cover/reproduction}}{2}$$

Assumption:

For oak savannah and irrigated agriculture, V_1 and V_2 are assumed to function equally in determining habitat suitability. For oak woodland, riparian forest, scrub habitats, habitat suitability is a combination of suitability of the habitat to support the food life requisite and the cover/reproduction life requisite.

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HABITAT SUITABILITY INDEX MODEL
Plain Titmouse (*Parus inornatus*)

by
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June 1989

Habitat Use Information

General

The plain titmouse inhabits oak and piñon-juniper woodlands from Oregon south and west to Texas. It is a year-round resident, and maintains a territory throughout the year. The species is generally a secondary cavity nester, although it may occasionally excavate its own hole.

Food

As a group, titmice take a wide variety of foods, but they are considered insectivorous during the summer, and consumers of fruit, seeds, and some insects in the winter (Ferrins 1979). Root (1967 - cited by Verner 1979), found that a large proportion of their food consisted of plant material and arthropods living on the bark of trees. Wagner (1981) found the plain titmouse took a great variety of arthropod taxa.

The titmouse is primarily a bark forager, although it also forages on tree foliage and occasionally on the ground (Hertz et. al. 1976). Most foraging by this species is done between 0-30 feet (0-9 m) of the ground (Wagner 1981; Hertz et. al. 1976). Hertz et al. found that plain titmice showed a preference for foraging in blue oaks (*Quercus douglasii*) over coast live oaks (*Q. agrifolia*). Hertz et. al. (1976) attributed the avoidance of live oaks to their smooth bark which is poor habitat for arthropods. Block and Morrison (1986) also found the titmouse to use blue oaks more than valley oaks (*Q. lobata*), black oak (*Q. kelloggii*), and canyon live oak (*Q. chrysolepis*) for foraging at Tejon Ranch, California. The plain titmouse will forage extensively in live oaks however, especially when other oak species are not present (Dixon 1964).

Reproduction

The plain titmouse is a secondary cavity nester, nesting in natural cavities, old woodpecker holes, or nest boxes. It prefers natural cavities over excavated cavities (Wilson, pers. comm.). Bent (1946) reported nests from 3-32 feet (1-10 m) above the ground. Bent, citing Dawson (1923), reported the titmouse to occasionally excavate its own nest cavity in blue oaks. The plain titmouse prefers wooded areas with intermediate to high percentage canopy coverage dominated by blue, live and valley oaks (Verner and Boss 1980).

Cover

Cover is provided by the oak woodlands and riparian areas in which the plain titmouse lives. Roost sites are provided by natural cavities, old woodpecker holes, or by dense foliage which simulates a cavity (Dixon 1949).

Interspersion

Plain titmice maintain year-round territories. Three territories observed by Hertz et. al. (1976) averaged 2.0 acres (0.8 ha) in California oak woodland. Dixon (1949) found 12 territories ranged located primarily in live oak woodland. These territories ranged in size from 3.3-12.5 acres (1.3-5.1 ha) with an average size of 6.3 acres (2.6 ha). According to Dixon (1956) 2.5 acres (1.0 ha) would probably be close to an absolute minimum size for a territory.

Water Requirements

In a study by Williams and Koenig (1980), the plain titmouse was classified as an occasional drinker.

Model Applicability

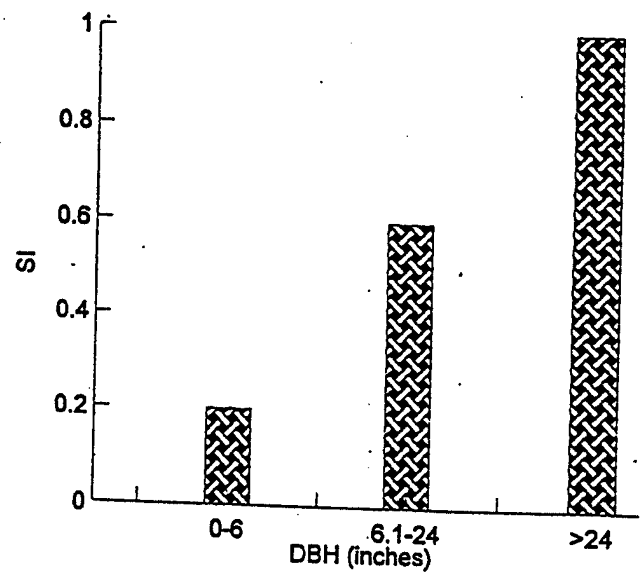
This model was developed for use in evaluating habitat suitability of oak savannah, oak woodland, and riparian woodland in Merced, Fresno, Stanislaus, and San Benito Counties in California from 500 - 2,500 ft in elevation. The basic assumptions for using the model are that meeting the reproductive needs of the plain titmouse will take care of its cover and food needs throughout the year. This assumption seems warranted. Verner (1979) believes that proper management for oaks for breeding birds should also provide the habitat needs for species that use oaks at other times of the year. In addition, it is assumed that water is not a limiting factor. It is assumed that the model is valid for use in riparian areas as well as the oak woodlands despite the fact that the model was initially developed for oak woodlands.

Model Description

Little quantitative data were found on the habitat needs of the plain titmouse. The most useful information was the information on habitat factors related to breeding for the species presented by Ohmann and Mayer (1986). Using data from the California Wildlife Habitat Relationships data base and the Forest Inventory and Analysis Research Unit inventory, Ohmann and Mayer developed a habitat suitability index model for the plain titmouse from which Variable 1 was derived.

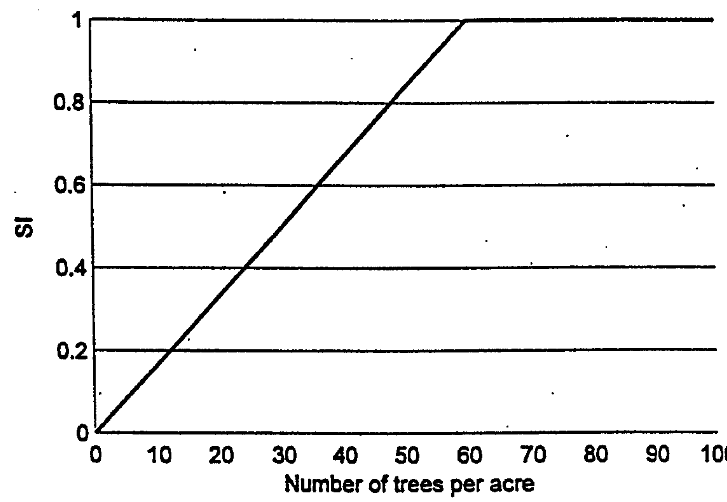
Variable 1. Tree diameter. (A tree is defined as a woody plant species 16 feet high or greater)

Ohmann and Mayer found tree size and percent canopy closure to be the major variables determining suitability of a habitat for the plain titmouse. Our model will assume that the diameter of a tree and the size of the canopy are correlated to the extent that they can be considered a single variable to be represented in this model by diameter at breast height (DBH). Presumably this variable best represents older trees with more cavities for nesting and greater bark surface which supports a greater prey base.



Variable 2. Trees per acre.

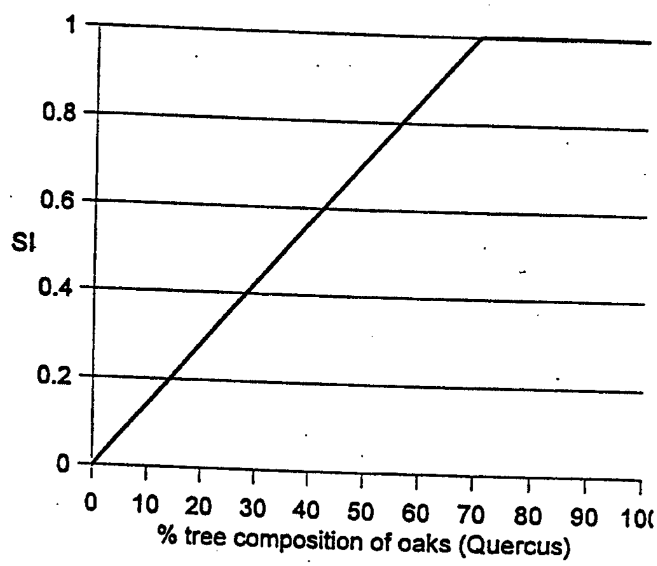
Plain titmouse abundance was found to increase as the number of trees increased (Wilson, pers. comm.). This may be particularly important in areas of low to moderate canopy cover. Studies at the Hopland, California field station found titmouse abundances to peak in areas with 60 trees/acre (750 trees/5 ha).



Both Variables 1 and 2 relate directly to the extent of a stand's canopy closure such that the importance placed on canopy closure by Ohmann and Mayer is incorporated into this model through the use of Variables 1 and 2.

Variable 3. Percent composition of tree species that are oaks (*Quercus*).

Verner and Boss (1980) stated that the plain titmouse prefers stands dominated by blue, live and valley oaks. We have been unable to find and studies documenting the presence of the plain titmouse in an area without a major proportion of oaks. For the sake of this model then, we will consider the presence of oaks to be a life requisite such that the optimum titmouse habitat is one dominated by oaks.



HSI Determination

In each sample area, tree diameter is measured along with the number of trees per acre and the percentage of those trees that are oaks. The Habitat Suitability Index for the sample site is then determined using the following formula:

HSI =(V1 + V2 + V3)/3

Suggestions for Applying the Model

1. The tree diameter classes for calculating Variable 1 (DBH) were not specified by Ohmann and Mayer. Therefore, all trees within the sample plot should be included in the DBH determination.

2. If no trees, 4-inch DBH or greater, are found in the sample plot, the HSI for the sample plot is 0.0. A 4-inch DBH tree is probably about the smallest tree that could have a cavity of sufficient size for the titmouse.

3. Ideally, all tree species in the study area should be fully leafed out when applying the model. Therefore, the best time for sampling is spring and summer.

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HABITAT SUITABILITY INDEX MODELS: YELLOW WARBLER

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series (FWS/OBS-82/10), which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information Section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. The habitat use information provides the foundation for HSI models that follow. In addition, this same information may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents a habitat model and information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The application information includes descriptions of the geographic ranges and seasonal application of the model, its current verification status, and a listing of model variables with recommended measurement techniques for each variable.

In essence, the model presented herein is a hypothesis of species-habitat relationships and not a statement of proven cause and effect relationships. Results of model performance tests, when available, are referenced. However, models that have demonstrated reliability in specific situations may prove unreliable in others. For this reason, feedback is encouraged from users of this model concerning improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning. Please send suggestions to:

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YELLOW WARBLER (*Dendroica petechia*)

HABITAT USE INFORMATION

General

The yellow warbler (*Dendroica petechia*) is a breeding bird throughout the entire United States, with the exception of parts of the Southeast (Robbins et al. 1966). Preferred habitats are wet areas with abundant shrubs or small trees (Bent 1953). Yellow warblers inhabit hedgerows, thickets, marshes, swamp edges (Starling 1978), aspen (*Populus* spp.) groves, and willow (*Salix* spp.) swamps (Salt 1957), as well as residential areas (Morse 1966).

Food

More than 90% of the food of yellow warblers is insects (Bent 1953), taken in proportion to their availability (Busby and Sealy 1979). Foraging in Maine occurred primarily on small limbs in deciduous foliage (Morse 1973).

Water

Dietary water requirements were not mentioned in the literature. Yellow warblers prefer wet habitats (Bent 1953; Morse 1966; Stauffer and Best 1980).

Cover

Cover needs of the yellow warbler are assumed to be the same as reproduction habitat needs are discussed in the following section.

Reproduction

Preferred foraging and nesting habitats in the Northeast are wet areas, partially covered by willows and alders (*Alnus* spp.), ranging in height from 1.5 to 4 m (5 to 13.3 ft) (Morse 1966). It is unusual to find yellow warblers in extensive forests (Hebard 1961) with closed canopies (Morse 1966). Yellow warblers in small islands of mixed coniferous-deciduous growth in Maine utilized deciduous foliage far more frequently than would be expected by chance alone (Morse 1973). Coniferous areas were mostly avoided and areas of low deciduous growth preferred.

Nests are generally placed 0.9 to 2.4 m (3 to 8 ft) above the ground, and nest heights rarely exceed 9.1 to 12.2 m (30 to 40 ft) (Bent 1953). Plants used for nesting include willows, alders, and other hydrophytic shrubs and trees (Bent 1953), including box-elders (*Acer negundo*) and cottonwoods (*Populus* spp.) (Schrantz 1943). In Iowa, dense thickets were frequently occupied by yellow warblers while open thickets with widely spaced shrubs rarely contained nests (Kendeigh 1941).

Males frequently sing from exposed song perches (Kendeigh 1941; Ficken and Ficken 1965),

although yellow warblers will nest in areas without elevated perches (Morse 1966).

A number of Breeding Bird Census reports (Van Velzen 1981) were summarized to determine nesting habitat needs of the yellow warbler, and a clear pattern of habitat preferences emerged. Yellow warblers nested in less than 5% of census areas comprised of extensive upland forested cover types (deciduous or coniferous) across the entire country. Approximately two-thirds of all census areas with deciduous shrub-dominated cover types were utilized, while shrub wetlands types received 100% use. Wetlands dominated by shrubs had the highest average breeding densities of all cover types [2.04 males per ha (2.5 acre)]. Approximately two-thirds of the census areas comprised of forested draws and riparian forests of the western United States were used, but average densities were low [0.5 males per ha (2.5 acre)].

Interspersion

Yellow warblers in Iowa have been reported to prefer edge habitats (Kendeigh 1941); Stauffer and Best 1980). Territory size has been reported as 0.16 ha (0.4 acre) (Kendeigh 1941) and 0.15 ha (0.37 acre) (Kammeraad 1964).

Special Considerations

The yellow warbler has been on the Audubon Society's Blue List of declining birds for 9 of the last 10 years (Tate 1981).

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model has been developed for application within the breeding range of the yellow warbler.

Season. This model was developed to evaluate the breeding season habitat needs of the yellow warbler.

Cover types. This model was developed to evaluate habitat in the dominant cover types used by the yellow warbler. Deciduous Shrubland (DS) and Deciduous Scrub/Shrub Wetland (DSW) (terminology follows that of U.S. Fish and Wildlife Service 1981). Yellow warblers only occasionally utilize forested habitats and reported populated densities in forests are low. The habitat requirements in forested habitats are not well documented in the literature. For these reasons, this model does not consider forested cover types.

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous that is required before an area will be occupied by a species. Information on the minimum habitat area for the yellow warbler was not located in the literature. Based on reported territory sizes, it is assumed that at least 0.15 ha (0.37 acre) of suitable habitat must be available for the yellow warbler to occupy an area. If less than this amount is present, the HSI is assumed to be

0.0.

Verification level. Previous drafts of the yellow warbler habitat model were reviewed by Douglass H. Morse and specific comments were incorporated into the current model (Morse, pers. comm.).

Model Description

Overview. This model considers the quality of the reproduction (nesting) habitat needs of the yellow warbler to determine overall habitat suitability. Food, cover, and water requirements are assumed to be met by nesting needs.

The relationship between habitat variables, life requisites, cover types, and the HSI for the yellow warbler is illustrated in Figure 1.

Figure 1. Relationship between habitat variables, life requisites, cover types, and the HSI for the yellow warbler.

```
                                   Life
Habitat variable                requisite                  Cover types
Percent deciduous shrub\
crown cover             \
                         \
Average height of         \                         Deciduous Shrubland
deciduous shrub canopy     \---------Reproduction--------------Deciduous Scrub/ ----------HSI
                           /                        Shrub Wetland
Percent of shrub canopy   /
comprised of hydrophytic /
shrubs                  /
```

The following sections provide a written documentation of the logic and assumptions used to interpret the habitat information for the yellow warbler and to explain and justify and variable and equations that are used in the HSI model. Specifically, these sections cover the following: (1) identification of variables that will be used in the model; (2) definition and justification of the suitability levels of each variable; and (3) description of the assumed relationship between variables.

Reproduction component. Optimal nesting habitat for the yellow warbler is provided in wet areas with dense, moderately tall stands of hydrophytic deciduous shrubs. Upland shrub habitats on dry sites will provide only marginal suitability.

It is assumed that optimal habitats contain 100% hydrophytic deciduous shrubs and that habitats with no hydrophytic shrubs will provide marginal suitability. Shrub densities between 60 and 80% crown cover are assumed to be optimal. As shrub densities approach zero cover, suitability also approaches zero. Totally closed shrub canopies are assumed to be of only moderate suitability, due to the probable restrictions on movement of the warblers in those conditions. Shrub heights of 2 m (6.6 ft) or greater are assumed to be optimal, and suitability will decrease as heights decrease to zero.

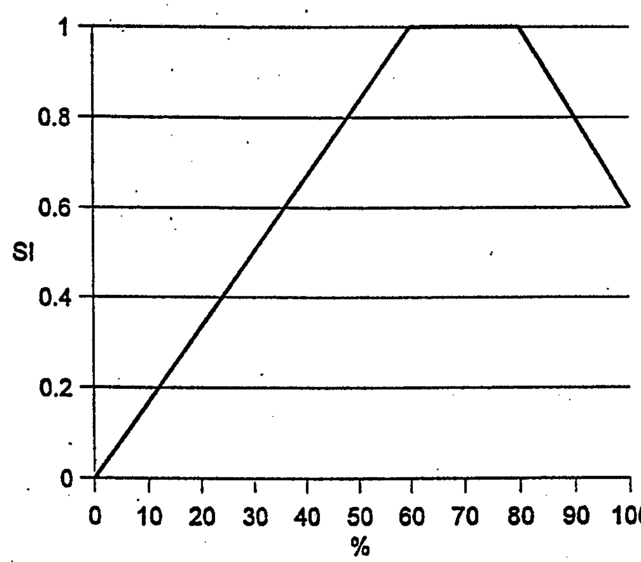
Each of these habitat variables exert a major influence in determining overall habitat quality for the yellow warbler. A habitat must contain optimal levels of all variables to have maximum suitability. Low values of any one variable may be partially offset by higher values of the remaining variables. Habitats with low values for two or more variables will provide low overall suitability levels.

Model Relationships

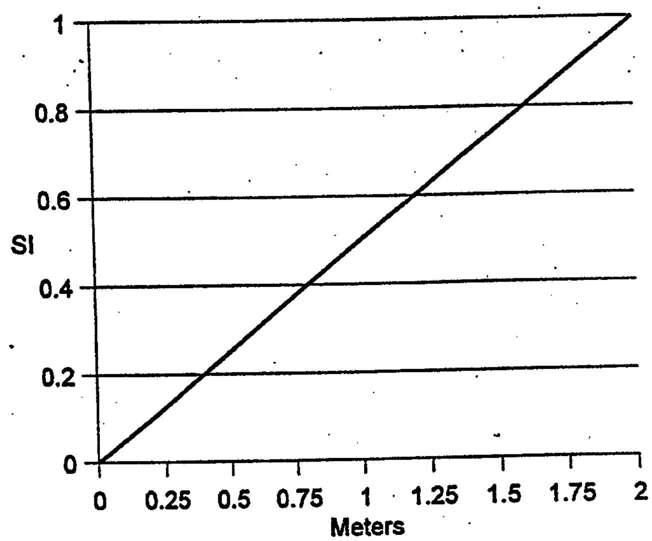
<u>Suitability Index (SI) graphs for habitat variables</u>. This section contains suitability index graphs that illustrate the habitat relationships described in the previous section.

<u>Cover-type</u> <u>Variable</u>

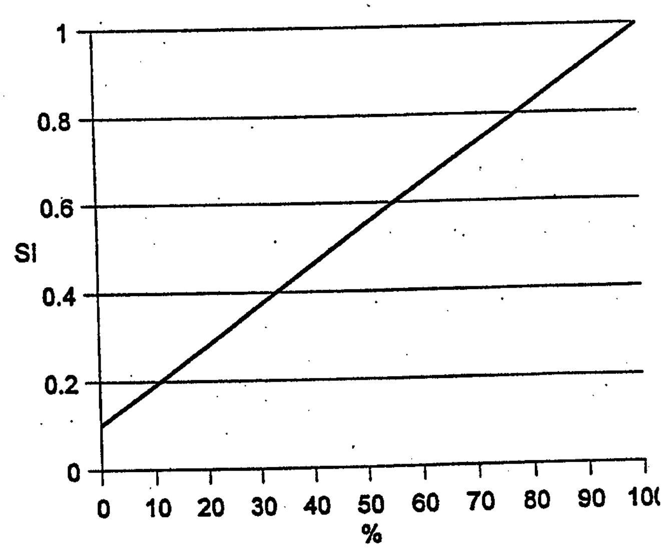
DS,DSW **V_1 Percent deciduous shrub crown cover.**



DS,DSW V$_2$ Average height of deciduous shrub canopy.



DS, DSW V$_3$-Percent of deciduous shrub canopy comprised of hydrophytic shrubs.



Equations. In order to obtain life requisite values for the yellow warbler, the SI values for appropriate variables must be combined with the use of equations. A discussion and explanation of the assumed relationship between variables was included under Model Description, and the specific equation in this model was chosen to mimic these perceived biological relationships as closely as possible. The suggested equation for obtaining a reproduction value is presented below.

Life requisite	Cover type	Equation
Reproduction	DS,DSW	$(V_1 \times V_2 \times V_3)^{1/3}$

HSI determination. The HSI value for the yellow warbler is equal to the reproduction value.

Application of the Model

Definitions of variables and suggested field measurement techniques (Hays et al. 1981) are provided in Figure 2.

Figure 2. Definitions of variables and suggested measurement techniques.

Variable (definition)	Cover types	Suggested techniques
V_1 Percent deciduous shrub crown cover (the percent of the ground that is shaded by a vertical projection of the canopies of woody deciduous vegetation which are less than 5 m (16.5 ft) in height).	DS,DSW	Line intercept
V_2 Average height of deciduous shrub canopy (the average height from the ground surface to the top of those shrubs which comprise the uppermost shrub canopy).	DW,DSW	Graduated rod

V_3 Percent of deciduous shrub canopy comprised of hydrophytic shrubs (the relative percent of the amount of hydrophytic shrubs compared to all shrubs, based on canopy cover). | DW.DSW | Line Intercept

SOURCES OF OTHER MODELS

No other habitat models for the yellow warbler were located.

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APPENDIX C
HABITAT EVALUATION PROCEDURES

PINE FLAT DAM FISH AND WILDLIFE HABITAT RESTORATION PROJECT PIPELINE INVESTIGATION

SUMMARY OF ALTERNATIVES

This report describes annual grassland, wetland, and salt scrub impacts associated with the construction of six miles of pipeline that would link Mendota Pool to the Janes By-Pass. This project will focus on baseline and future conditions with and without the project. The pipeline is part of the Pine Flat Fish and Wildlife Habitat Restoration project which deals with the water transfer plan. The pipeline would augment flows and temperatures downstream of Pine Flat dam. The HEP analysis will consider following alternatives: 1) 1 no action; 2) pipeline would be constructed and natural regeneration would occur; and 3) pipeline would be constructed, and herbaceous and shrub planting occurs. Alternative 3, includes planting shrub species to maximize the dessert cottontail HSI model. Each restoration alternative will produce an associated HSI and AAHU's values.

HEP DESCRIPTION

HEP is an impact assessment methodology developed by the Fish and Wildlife Service (Service) and other State and Federal resources agencies which can be used to document the quality and quantity of available habitat for selected wildlife species. HEP provides information for two general types of wildlife habitat comparisons: 1) the relative value of different areas at the same point in time, and 2) the relative value of the same areas at future points in time. By combining the two types of comparisons, the impacts of proposed or anticipated land and water-use changes on wildlife habitat can be quantified. In a similar manner, any compensation needs (in terms of acreage) for the project can also be quantified.

A HEP application is based on the assumption that habitat for selected wildlife species or communities can be described by a model which produces a Habitat Suitability Index (HSI). The HSI, a value from 0.0 to 1.0, is assumed to relate directly to the carrying capacity of the habitat being evaluated. The HSI is multiplied by the area of available habitat to obtain Habitat Units (HUs). Changes in habitat value and quantity are tracked over time at specified time periods known as target years (TYs). Those changes over the life of the project are annualized to yield Average Annual Habitat Units (AAHUs). The life of the project is based upon a 50-year period. The period of analysis is equal to the life of the project plus any construction period. The difference in AAHUs for various project scenarios permit comparison of alternatives.

Impacts associated with each future scenario are evaluated for a number of target years. To predict changes in a HSI for each future scenario, it is necessary to make assumption regarding baseline and future values within project impact and compensation areas. These assumption are listed in HEP Appendix C-1. Given these assumptions, long-term losses and gains in HUs can then be estimated for each future scenario over the life of the project, then expressed as AAHU gains or losses. The reliability of HEP application, including the significance of HUs and AAHUs is directly dependent on the ability of the HEP user(s) to assign a well-defined and accurate HSI to the selected evaluation species or communities. Also, the HEP user(s) must be able to identify and measure (or predict) the area of each distinct habitat that is utilized by fish and wildlife within the project impact area. Both the HSIs and the habitat acreage must also be reasonably estimable at various future points in time. SIs and HSIs calculated from baseline and

future assumptions are given in HEP Appendix C-2. HEP results are shown in HEP Appendix C-3.

A fundamental and critical step in designing any HEP application is the setting of overall goals and objectives. In this HEP application, such goals and objectives were developed based on the overall, long-term resource management goals of the Service.

The following goals and objectives were established for the HEP used in this study:

1. The primary goal was to evaluate the impacts (benefits) on wildlife from the proposed restoration plan.

2. Quantify habitat conditions before project construction.

3. Quantify habitat condition after project construction.

HSI MODEL SELECTION

Construction of the project would impact annual grassland, and create riparian and oak woodland habitat. HSI models were selected to evaluate the changes in habitat value over the life of the project. Each model contains specific habitat variables that, when measured, result in a relative numeric value of the habitat type the models utilize. As restoration measures are implemented and the habitats are changed or enhanced, the future results of the HEP model variables may increase or decrease depending on benefits or impacts from the proposed restoration work. Discussed below are the species selected to evaluate the habitat affected and the reasons why they were selected. Table C-1 presents the evaluation species, variable descriptions, habitats measured, and methods used to obtain a value for each variable. The walnut orchard was not analyzed in the HEP because the proposed riparian plantings would offset impacts to the orchard. Annual grassland habitat was also not evaluated in this report because it could be mitigated by reseeding disturbed sections of the project area with an appropriate native grass seed mix.

The western meadow lark HSI model (Service 1980) was selected for the salt scrub habitat because: (1) it is primarily a grassland species, (2) it roosts and nests in the grassland, and (3) the Service had developed a model for the species which had been used and accepted by various State and Federal resource agencies in the past.

The side blotched lizard HSI model (Strait 1989) was selected for use in the project annual grassland/alkali playa habitat because: (1) it is primarily a grassland species, (2) it also inhabits washes, flats, arroyos, alluvial fans, and playas and (3) the Service had developed a model for the species which had been used and accepted by various State and Federal resource agencies in the past.

The dessert cottontail HSI Model (Service 1985) was selected for use in both the salt bush scrub/alkali sink habitat because: (1) it nests in tall grass, hollow logs, and burrows below ground, (2) it uses tall grass as refugia, and (3) the Service had developed a model for the species

which had been used and accepted by various State and Federal resource agencies in the past.

METHODOLOGY

The 1980 HEP procedures were used in this application which was conducted on June 30, 1998. Participants in the data collection portion of the HEP were representatives from the Service (Brian Cordone) and Kings River Conservation District (Jeff Halstead), Corps (Patricia Robberson), Endangered Species Recovery Division (Curt Uptain). Staff from the Department of Fish and Game was invited to participate, but were unable to attend.

Grassland and salt bush habitat will be impacted by this project. The proposed project description is to construct a 7 feet in diameter pipeline from Mendota Pool to Janes bypass. This project would impact 5.5 acres of grassland habitat, and 0.2 acres of vernal pools. Existing Habitat Suitability Index models for the grassland habitat were selected to show impacts.

The capacity of each sample site to meet the needs of the habitat within the project impact were determined by the HEP team through a combination field measurement of specific habitat variables, and assumptions based on biological knowledge. A HSI was then manually calculated for each habitat, yielding a rating on a scale of 0.0 to 1.0, with higher numerical ratings indicative of a higher value habitat.

In order to make comparisons of no action and with project conditions, specific restoration alternatives were developed. The alternatives are as follows: 1) without project project 2) natural regeneration, and 3) shrub plantings and natural regeneration.

RESULTS

Under the no action management plan, the 5.5 acres under consideration for restoration would be left in its present condition. The grassland area would continue to be disced and utilized for various agricultural purposes and exhibit low habitat values.

Through the HEP analysis (Appenices C1-C3) quantitative habitat values termed Average Annual Habitat Units (AAHUs) were calculated for each management plan. As shown in Tables C-2 and C-4 both plans yielded a positive net change in AAHUs. The greatest benefit to wildlife species would be accomplished by constructing restoration Alternative 3. However, these initial determinations do not take into account costs for implementation or operation and maintenance. These factors will also influence the decisions on which management plan(s) are pursued.

Table C-1. Evaluation species, variable description, applicable habitat, and method used to obtain the values for each HSI species model variable for the proposed restoration improvements to the Pine Flat Fish and Wildlife Habitat Restoration Project.

Evaluation Species	Variable Description	Habitat	Method Used
w. meadow Lark	V1-Height of herbaceous vegetation.	Salt scrub	1 m2 quadrat along transect
	V2-Density of herbaceous vegetation	Salt scrub	1 m2 quadrat along transect
	V3-Abundance of singing perches.	Salt scrub	Ocular estimate
side-blotched lizard	V1-% cover of annual plants.	Annual grassland/alkali playa	1 m2 quadrat along transect
	V2-% cover of perennial plants.	Annual grassland/alkali playa	1 m2 quadrat along transect
	V3-Animal burrows per hectare.	Annual grassland/alkali playa	Ocular estimate
desert cottontail	V1-% cover of preferred herbaceous vegetation >0.4 m tall.	Salt bush scrub/alkali sink	1 m2 quadrat along transect
	V2-% cover of preferred forage shrubs and vines.	Salt bush scrub/alkali sink	1 m2 quadrat along transect
	V3-% canopy closure of shrubs >0.4 m tall.	Salt bush scrub/alkali sink	Spherical densiometer
	V4-% cover of rock piles & fallen trees.	Salt bush scrub/alkali sink	1 m2 quadrat along transect
	V5-Edge availability.	Salt bush scrub/alkali sink	Ocular estimate
	V7-Distance between escape cover and foraging areas.	Salt bush scrub/alkali sink	Tape measure
	V8-Distance to permanent water source.	Salt bush scrub/alkali sink	Tape measure

Table C-2. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units or AAHUs) by cover type for the Pine Flat Fish and Wildlife Restoration Plan, Alternative 2.

COVER-TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH THE PROJECT (Acres at TY 51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Seasonal wetlands	(not analyzed in HEP)	0.2	0.0	-0.2	Na	Na	Na
salt scrub	western meadow lark	5.5	+5.7	+0.2	5.01	5.25	+0.24
	side blotched lizard				3.57	4.12	+0.55
	desert cottontail				0.0	0.0	0.0
Totals		5.7	5.7	0	8.58	+9.37	+0.79

The associated data variables used in determining the benefits for Alternative 2 are identified below in Table C-3.

Table C-3. HSIs and acreage for the cover-types for all years for f\uture conditions without the project (TY 0) and future conditions with the project (TY's 1-51) for the Pine Flat Fish and Wildlife Habitat Restoration Plan, Alternative 2.

SPECIES MODEL/ COVER-TYPE	TY 0		TY 1		TY 5		TY 20		TY 51	
	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI
western meadow lark/ annual grassland	5.5	0.91	5.5	0.81	5.5	0.97	5.5	0.96	5.5	0.96
side blotched Lizard/annual grassland	5.5	0.65	5.5	0.4	5.5	0.6	5.5	0.81	5.5	0.81
desert cottontail/ annual grassland salt scrub	5.5	0.16	5.5	0.0	5.5	0.0	5.5	0.0	5.5	0.0

Table C-4. Summary of changes in habitat area (acres) and value (Average Annual Habitat Units of AAHUs) by cover type for the Pine Flat Fish and Wildlife Restoration Plan, Alternative 3.

COVER-TYPE	HSI MODEL	WITHOUT THE PROJECT (Acres at TY 0)	WITH-THE-PROJECT (Acres at TY51)	NET CHANGE IN ACRES	AAHUS WITHOUT PROJECT	AAHUS AT TY51 FOR EACH HSI MODEL	NET CHANGE IN AAHUs
Seasonal wetlands	(not analyzed in HEP)	0.2	0.0	-0.2	NA	NA	NA
Annual Grassland/salt scrub	western meadow lark	5.5	+5.7	+0.2	5.01	4.13	-0.88
	side blotched lizard				3.57	3.06	-0.51
	desert cottontail				0.0	2.32	+2.32
Totals		5.7	5.7	0	8.58	9.51	+0.93

The associated data variables used in determining the benefits for Alternative 3 are identified below in Table C-5.

Table C-5. HSIs and acreage for the cover-types for all years for future conditions without the project (TY 0) and future conditions with the project (TY's 1-51) for the Pine Flat Fish and Wildlife Habitat Restoration Plan, Alternative 3.

SPECIES MODEL/ COVER-TYPE	TY 0		TY 1		TY 5		TY 20		TY 51	
	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI	AREA	HSI
western meadow lark/ annual grassland	5.5	0.91	5.5	0.81	5.5	0.85	5.5	0.72	5.5	0.72
side blotched Lizard/annual grassland	5.5	0.65	5.5	0.87	5.5	0.70	5.5	0.5	5.5	0.5
desert cottontail/ annual grassland salt scrub	5.5	0.0	5.5	0.44	5.5	0.45	5.5	0.42	5.5	0.42

LITERATURE CITED

USFWS. 1985. Habitat Suitibality Index Model: Desert Cottontail. Sacramento Fish and Wildlife Office, Sacramento, CA. 6pp.

USFWS. 1989. Habitat Suitibality Index Model: Side-Blotched Lizard. Sacramento Fish and Wildlife Office, Sacramento, CA. 10pp.

USFWS. 1980. Draft Habitat Suitibality Index Model: Western MeadowLark. Sacramento Fish and Wildlife Office, Sacramento, CA. 9pp.

HEP APPENDIX C-1
ASSUMPTIONS USED IN PREDICTING FUTURE SCENARIOS

HEP APPENDIX C-1
ASSUMPTIONS USED IN PREDICTING FUTURE SCENARIOS FOR THE PINE FLAT FISH AND WILDLIFE HABITAT RESTORATION PROJECT HEP

General

1. HEP is a suitable methodology for quantifying project impacts to fish and wildlife.
2. Construction time and shrub planting will only take one year to complete.
3. Year 50 was considered to be near the reference site conditions.

Future without the Project (Impact Area)

1. Existing habitat in impact area is grassland.
2. Future land uses would not change from current use.

Future with the Project (Impact Area)
ANNUAL GRASSLAND

1. Shrubs are planted as mitigation to optimize the desert cottontail HSI model.
2. TY 1 correlates with actual data taken from transect 3 of this study. This transect was located in a field that was disced one year prior to data collection and exhibited the same type of plant makeup.
3. Shrubs planted are 2 feet average height.
4. Orchards nearby remain in production and are utilized as singing perches by the meadowlark.
5. Shrub mortality becomes suitable escape cover for the rabbit.
6. Shrubs planted reduce percent cover of annual plants.
7. More diverse vegetation in area draws more animals, which in turn, increases the number of burrows per hectare.
8. A temporal equilibrium between annual cover and perennial cover has occurred keeping the values in TY 20 and TY 51 the same.
9. It is possible to manage the habitat to achieve better than baseline conditions.

Evaluation Species Selection

1. The species selected are good representatives of the habitat quality per each habitat, and the changes in habitat quality relate to each evaluation species.

2. The species selected are sufficient to gauge the extent of impacts from the project.

Field Data Collection

1. The methods used to select sample sites were sufficiently random for the purposes of this study.

HEP APPENDIX C-2
DATA ANALYSIS ASSUMPTIONS

HEP APPENDIX C-2
DATA ANALYSIS ASSUMPTIONS FOR THE PINE FLAT FISH AND WILDLIFE HABITAT RESTORATION HEP

I. ALTERNATIVE 2, PIPELINE CONSTRUCTED AND NATURAL REGENERATION

Western Meadow Lark
Variables:
V1-Height of herbaceous vegetation.
V2-Density of herbaceous vegetation
V3-Abundance of perches.

HSI Calculation: $[(V1*V2)^{½} + V3]/2$

Side Blotched Lizard
Variables:
V1-% cover of annual plants.
V2-% cover of perennial plants.
V3-Animal burrows per hectare.

HSI Calculation: $[V1+(V2 + V3)]/2$

Desert Cottontail
Variables:
V1-% cover of preferred herbaceous vegetation >0.4 m tall.
V2-% cover of preferred forage shrubs and vines.
V3-% canopy closure of shrubs >0.4 m tall.
V4-% cover of rockpiles & fallen trees.
V5-Edge availability.
V7-Distance between escape cover and foraging areas.
V8-Distance to permanent water source.

SIFood = $[(V7*V8)^{½} * (V1 + V2)]$ where V1 + V2 does not exceed 1.0
SICover= $[V5(V3+V4)]$ where V3 + V4 does not exceed 1.0
HSI = lowest of the values for the food and cover components

1a. Alternative 2, Without Project meadowlark

TY 0 Baseline conditions. Annual grassland and salt scrub 5.5 acres.

V1-6"	SI= 0.78	
V2-40%	SI= 0.85	HSI=$[(V1*V2)^{½} + V3]/2$=0.91
V3-4	SI= 1.0	

TY 1-51 No change from TY 0.

1b. Alternative 2, Without Project lizard

TY 0 Baseline conditions. Annual grassland and salt scrub 5.5 acres.

V1-20%"	SI= 0.45	
V2-90%	SI= 0.19	HSI=$[V1+(V2 + V3)]/2$= 0.65
V3-350	SI= 0.66	

TY 1-51 No change from TY 0.

1c. Alternative 2, Without Project cottontail
TY 0. Baseline conditions. Annual grassland and salt scrub 5.5 acres.

V1-10%"	SI= 0.07	
V2-0%	SI= 0.0	SIFood=[(V7*V8)^½ * (V1 + V2)]= 0.03
V3-0	SI= 0.0	SICover= [V5(V3+V4)]=0.0
V4-0	SI= 0.0	HSI=0.0
V5-1	SI= 0.13	
V7-50'	SI= 0.95	
V8-400'	SI= 0.2	

TY 1-51 same as baseline conditions.

1d. Alternative 2, With Project meadowlark
TY 0 Baseline conditions. Annual grassland and salt scrub 5.5 acres.

V1-6"	SI= 0.78	
V2-40%	SI= 0.85	HSI=[(V1*V2)^½ + V3]/2=0.91
V3-4	SI= 1.0	

TY 1, Annual grassland and salt scrub 5.5 acres.
Assume natural regeneration.

V1-4.5"	SI= 0.6	
V2-30%	SI= 0.63	HSI=[(V1*V2)^½ + V3]/2=0.81
V3-4	SI= 1.0	

TY 5, Annual grassland and salt scrub 5.5 acres.

V1-7"	SI= 0.9	
V2-50%	SI= 1.0	HSI=[(V1*V2)^½ + V3]/2=0.97
V3-4	SI= 1.0	

TY 20, Annual grassland and salt scrub 5.5 acres.

V1-6.3"	SI= 0.84	
V2-50-100%	SI= 1.0	HSI=[(V1*V2)^½ + V3]/2=0.96
V3-4	SI= 1.0	

TY 50, Annual grassland and salt scrub 5.5 acres.

V1-6.3"	SI= 0.84	
V2-50-100%	SI= 1.0	HSI=[(V1*V2)^½ + V3]/2=0.96
V3-4	SI= 1.0	

1e. Alternative 2, With Project lizard
With Project side blotched lizard
TY 0. Baseline conditions, Annual grassland and salt scrub 5.5 acres.

V1-20%"	SI= 0.45	
V2-90%	SI= 0.19	HSI=[V1+(V2 + V3)]/2= 0.65
V3-350	SI= 0.66	

TY 1, Annual grassland and salt scrub 5.5 acres.
Assume natural regeneration.

V1-33%"	SI= 0.73	
V2-0%	SI= 0.0	HSI=[V1+(V2 + V3)]/2= 0.4
V3-50	SI= 0.05	

TY 5, Annual grassland and salt scrub 5.5 acres.

V1-50%"	SI= 1.0	
V2-0%	SI= 0.0	HSI=[V1+(V2 + V3)]/2= 0.6
V3-100	SI= 0.2	

TY 20, Annual grassland and salt scrub 5.5 acres.

V1-71%".	SI= 0.57	
V2-25%	SI= 0.6	HSI=[V1+(V2 + V3)]/2= 0.81
V3-250	SI= 0.45	

TY 51, Annual grassland and salt scrub 5.5 acres.

V1-71%"	SI= 0.45	
V2-25%	SI= 0.6	HSI=[V1+(V2 + V3)]/2= 0.81
V3-250	SI= 0.45	

1f. Alternative 2, With Project cottontail
TY 0, same as baseline conditions.

TY 1, Annual grassland and salt scrub 5.5 acres.

Assume natural regeneration.

V1-0%	SI= 0.0	
V2-0%	SI= 0.0	SIFood=[(V7*V8)^{½} * (V1 + V2)]= 0.0
V3-0	SI= 0.0	SICover= [V5(V3+V4)]=0
V4-0	SI= 0.0	HSI=0
V5-0	SI= 0.0	
V7-86'	SI= 0.84	
V8-400'	SI= 0.2	

TY 5, Annual grassland and salt scrub 5.5 acres.

V1-5%"	SI= 0.05	
V2-0%	SI= 0.0	SIFood=[(V7*V8)^{½} * (V1 + V2)]= 0.0
V3-0	SI= 0.0	SICover= [V5(V3+V4)]=0
V4-0	SI= 0.0	HSI=0
V5-1	SI= 0.13	
V7-60'	SI= 0.9	
V8-400'	SI= 0.2	

TY 20, Annual grassland and salt scrub 5.5 acres.

V1-9%"	SI= 0.09	
V2-0%	SI= 0.0	SIFood=[(V7*V8)^{½} * (V1 + V2)]= 0.0
V3-0	SI= 0.0	SICover= [V5(V3+V4)]=0
V4-0	SI= 0.0	HSI=0
V5-1	SI= 0.13	
V7-40'	SI= 0.99	
V8-400'	SI= 0.2	

TY 50 same as TY 20, Annual grassland and salt scrub 5.5 acres.

II. ALTERNATIVE 3, PIPELINE CONSTRUCTED WITH HERBACEOUS REVEGETATION AND SHRUB PLANTING.

2a. Alternative 3, Without Project meadowlark

TY 0 Baseline conditions, Annual grassland and salt scrub 5.5 acres.

V1-6"	SI= 0.78	
V2-40%	SI= 0.85	HSI=[(V1*V2)$^{1/2}$ + V3]/2=0.91
V3-4	SI= 1.0	

TY 1-51 No change from TY 0.

2b. Alternative 3, Without Project lizard

TY 0 Baseline conditions, Annual grassland and salt scrub 5.5 acres.

V1-20%"	SI= 0.45	
V2-90%	SI= 0.19	HSI=[V1+(V2 + V3)]/2= 0.65
V3-350	SI= 0.66	

TY 1-51 No change from TY 0.

2c. Alternative 3, Without Project cottontail

TY 0. Baseline conditions, Annual grassland and salt scrub 5.5 acres.

V1-10%"	SI= 0.07	
V2-0%	SI= 0.0	SIFood=[(V7*V8)$^{1/2}$ * (V1 + V2)]= 0.03
V3-0	SI= 0.0	SICover= [V5(V3+V4)]=0
V4-0	SI= 0.0	HSI=0
V5-1	SI= 0.13	
V7-50'	SI= 0.95	
V8-400'	SI= 0.2	

TY 1-51 same as baseline conditions.

2d. Alternative 3, With Project meadowlark

With Project

TY 0 same as baseline conditions, Annual grassland and salt scrub 5.5 acres.

TY 1, Annual grassland and salt scrub 5.5 acres.
Assume natural regeneration.
Construction of pipeline is completed and shrubs and herbaceous revegetation has occurred.
shrubs are planted to maximize the desert cottontail model.
TY 1 correlates to actual data taken from transect 3 of this study. This transect was located in a field that was disced one year prior to data collection and exhibited the same type of plant presence.
Shrubs planted are an average of 2 feet in height.
Orchards nearby remain in production and are utilized as singing perches by the meadowlark.
Shrub mortality becomes suitable escape cover for the rabbit.
Shrubs planted reduce % cover of annual plants.

V1-4.5	SI=0.6	
V2-30%	SI=0.63	HSI=[(V1*V2)$^{1/2}$ + V3]/2=0.81
V3-4	SI=1.0	

TY 51, Annual grassland and salt scrub 5.5 acres.
A temporal equilibrium between annual cover and perennial cover has occurred keeping values in TY 51 the same as TY 20.

V1-20%"	SI= 0.45	
V2-80%	SI= 0.19	HSI=[V1+(V2 + V3)]/2= 0.5
V3-400	SI= 0.66	

2f. Alternative 3, With Project cottontail
TY 0, same as baseline conditions, Annual grassland and salt scrub 5.5 acres.

TY 1, Annual grassland and salt scrub 5.5 acres.

Assume natural regeneration.
Construction of pipeline is completed and shrubs and herbaceous revegetation has occurred.
shrubs are planted to maximize the desert cottontail model.
TY 1 correlates to actual data taken from transect 3 of this study. This transect was located in a field that was disced one year prior to data collection and exhibited the same type of plant presence.
Shrubs planted are an average of 2 feet in height.
Orchards nearby remain in production and are utilized as singing perches by the meadowlark.
Shrub mortality becomes suitable escape cover for the rabbit.
Shrubs planted reduce % cover of annual plants.

V1-50%"	SI= 0.5	
V2-50%	SI= 0.5	SIFood=[(V7*V8)$^{1/2}$ * (V1 + V2)]= 0.44
V3-30%	SI= 0.7	SICover= [V5(V3+V4)]=fail
V4-30%	SI= 0.7	HSI=0.44
V5-2	SI= 0.3	
V7-50'	SI= 0.95	
V8-400'	SI= 0.2	

TY 5, Annual grassland and salt scrub 5.5 acres.

shrub growth shades out annual plants reducing % coverage by annual plants.
More vegetation in area draws more animals increasing the number of burrows per hectare.

V1-40%	SI= 0.4	
V2-60%	SI= 0.6	HSI=[(V7*V8)$^{1/2}$ * (V1 + V2)]= 0.45
V3-60%	SI= 1.0	SICover= [V5(V3+V4)]=fail
V4-40%	SI= 1.0	HSI=0.45
V5-2	SI= 0.3	
V7-0'	SI= 1.0	
V8-400'	SI= 0.2	

TY 20, Annual grassland and salt scrub 5.5 acres.

V1-20%"	SI= 0.2	
V2-75%	SI= 0.75	SIFood=[(V7*V8)$^{1/2}$ * (V1 + V2)]= 0.42
V3-75%	SI= 0.9	SICover= [V5(V3+V4)]=fail
V4-40%	SI= 1.0	HSI=0.42
V5-2	SI= 0.3	
V7-50'	SI= 0.95	
V8-0	SI= 0.2	

TY 51, same as TY 20, Annual grassland and salt scrub 5.5 acres.

A temporal equilibrium between annual cover and perennial cover has occurred keeping values in TY 51 the same as TY 20.

Without Project

TY 0. Baseline conditions, Annual grassland and salt scrub 5.5 acres.

V1-10%"	SI= 0.07
V2-0%	SI= 0.0
V3-0	SI= 0.0
V4-0	SI= 0.0
V5-1	SI= 0.13
V7-50'	SI= 0.95
V8-400'	SI= 0.2

HSI=[(V7*V8)^{½} * (V1 + V2)]= 0.03
SICover= [V5(V3+V4)]=0
HSI=0

TY 1-51 same as baseline conditions, Annual grassland and salt scrub 5.5 acres.

HEP APPENDIX C-3
HABITAT SUITABILITY INDEX MODELS

DESERT COTTONTAIL

HABITAT SUITABILITY INDEX MODEL
DRAFT HABITAT SUITABILITY INDEX MODEL

DESERT COTTONTAIL (*Sylvilagus audubon*i)

U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

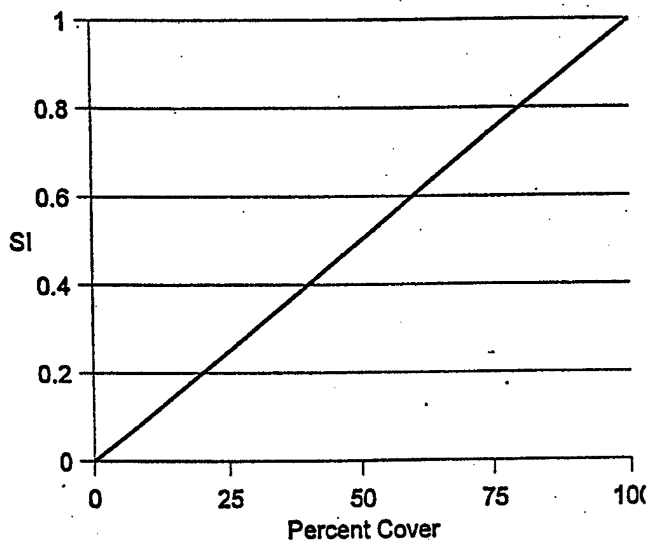
July 1985

Cover Type	Spatial Variable	Life Requisite	Habitat Variables
Foothill Grassland (P) Valley Grassland (N) Seasonal Wetlands (S)	Distance between escape cover and foraging areas (V_7)	Food	Percent coverage of preferred herbaceous Vegetation > 0.4 m Tall (V_1)
	Distance to permanent water source (V_8)		
	Edge availability (V_5)	Cover	Percent coverage of rockpiles and fallen trees (V_4)
Valley Woodland (W) Riparian (R) Shrubland Alkali Sink Salt Bush Scrub (A) Vineyard/Orchards (V)	Distance between escape cover and foraging area (V_7)		Percent coverage of preferred herbaceous Vegetation $\geq$ 0.4 m Tall (V_1)
	Distance to permanent water source (V_8)		Percent of preferred forage shrubs and vines (V_2)
	Edge availability (V_5)	Cover	Percent canopy closure of shrubs $\geq$ 0.4 m tall (V_3)
			Percent coverage rockpiles and fallen trees (V_4)
Cotton/Row Crops (C) Grain Crops (G) Irrigated Pasture	Distance between escape cover and foraging area (V_7)	Food	Percent coverage of preferred herbaceous Vegetation $\geq$ 0.4 m Tall (V_1)
	Distance to permanent water source (V_8)		Agricultural land management (V_6)
Marsh (W)	Distance between escape cover and foraging areas (V_7)	Cover	Percent canopy closure of shrubs $\geq$ 0.4 m tall (V_3)
	Edge availability (V_5)		

	Variable	Habitat Type	Suggested Technique
(V_1)	Percent coverage of preferred herbaceous Vegetation ≥ 0.4 m Tall	C,G,V,F,S,N,R,A,P,H,W	Quadrat along line transect
(V_2)	Percent coverage of preferred forage shrubs and vines	V,R,W,A,H	Line intercept
(V_3)	Percent canopy of closure of shrubs ≥ 0.4 m tall	V,M,H,W,A,H	Line intercept
(V_4)	Percent coverage rockpiles and fallen trees	V,F,S,N,R,A,H,W	Line intercept
(V_5)	Edge availability an index of the extent of edge between escape cover and foraging areas	V,P,S,N,M,R,A,H,W	Point count on line Intercept
(V_6)	Agricultural land management	C,G,P	Local data, visual observation
(V_7)	Distance between escape cover and foraging areas	C,G,P,V,F,S,N,W,R,A,H,W	Tape measure, aerial, photo interpretation
(V_8)	Distance to permanent water source or year-round source of succulent vegetation	C,G,P,V,F,S,N,R,A,H,W	Tape measure, aerial, photo interpretation

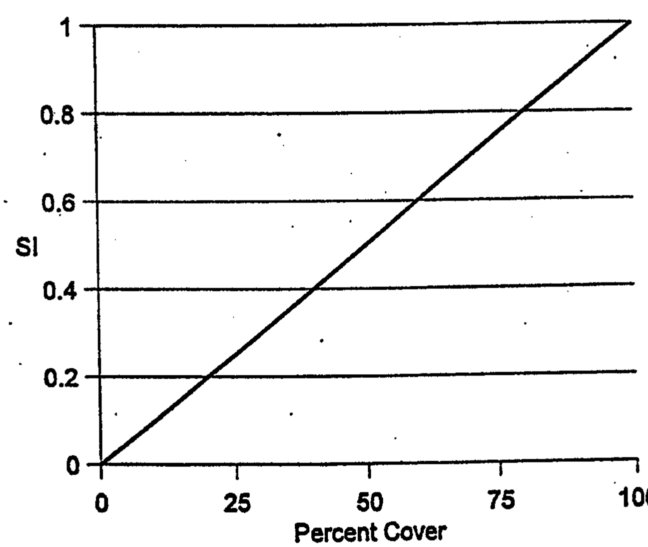
V_1 - Percent coverage of preferred herbaceous vegetation ≥ 0.4 meters tall.

Assumption: Grasses, forbs, sedges, rushes, alfalfa, clover, grains and other succulent green crops are preferred by desert cottontails (Orr 1940, Fitch 1947). 100% coverage of these plants provided optimum, foraging habitat.



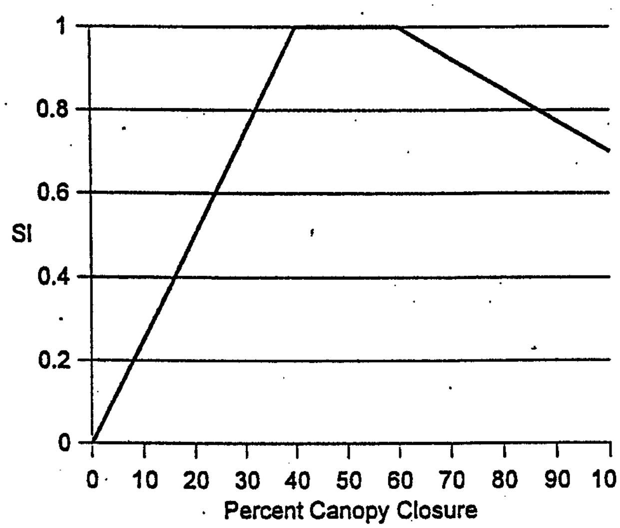
V_2 Percent coverage of preferred forage shrubs and vines.

Assumption: Preferred forage shrubs and vines include wild rose, blackberry willow, and *Baccharis* (Orr 1940, Fitch 1947); *Atriplex* (deCalesia 1979); and *Prosopis* (Turkowski 1975).



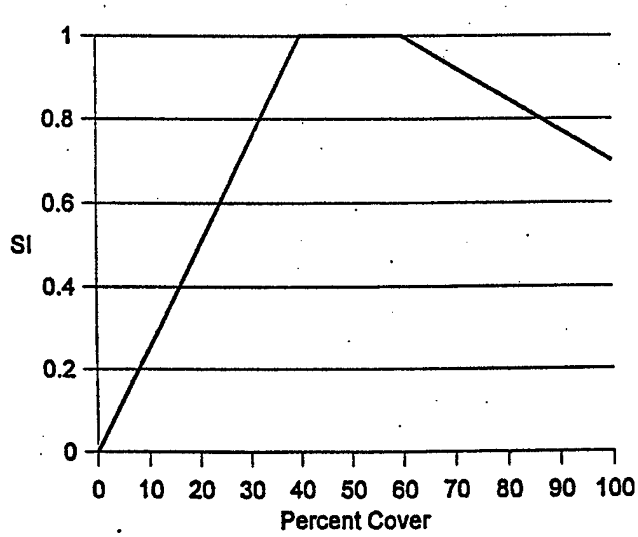
V_3 Percent canopy closure of shrubs ≥ 0.4 m tall

Assumption: A canopy closure of 40-60% is assumed to be optimum, providing a suitable mix of dense cover and foraging areas (CDFG 1985). Include measurement of persistent emergents and vines.



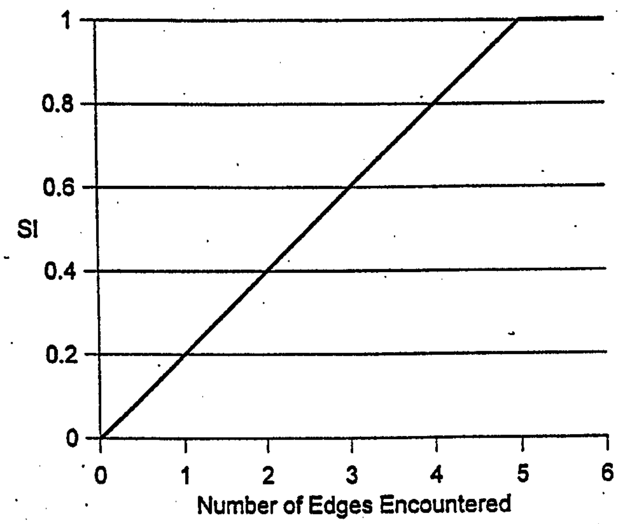
V_4 Percent coverage of rockpiles and fallen trees.

Assumptions: Rockpiles and fallen trees provide suitable escape cover for desert cottontails.(Fitch 1947).



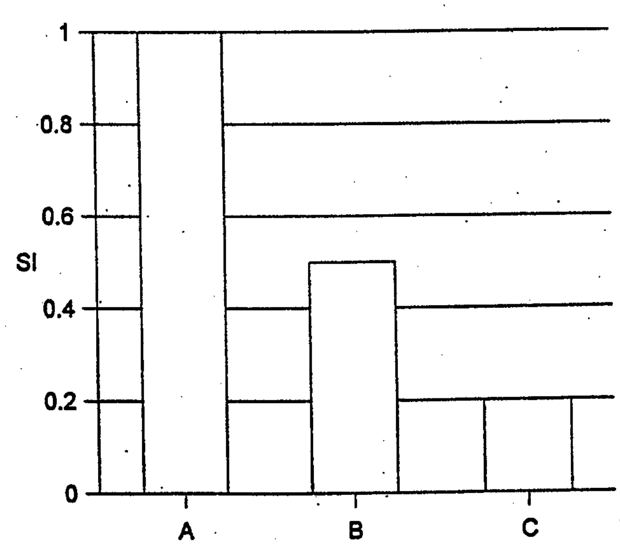
V_5 Edge availability - an index of the extent of edge between escape cover and foraging areas.

Assumptions: Abundant shrub/herbaceous vegetation interfaces (edges) contribute to high quality habitat for desert cottontails (CDFG 1985). Escape cover is defined as shrubs, vines, persistent emergents 0.4 m tall, rockpiles and fallen trees.



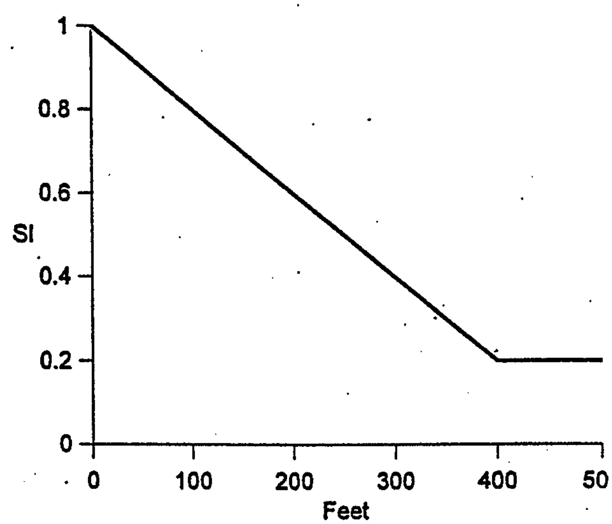
V_6 Agricultural land management

Assumptions: Desert cottontails utilize agricultural lands subjected to the least amount of land disturbances, particularly in late summer/fall when succulent crops may constitute the only food source available in abundance. Crops such as alfalfa and clover are preferred (Orr 1940).



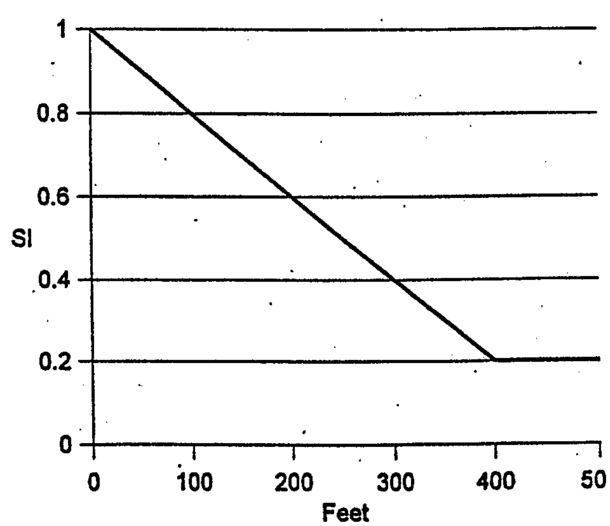
V_7 Distance between escape cover and foraging areas

Assumption: Fitch (1947) found a foraging diameter of 700 feet for desert cottontails in Madera County. Studies conducted by Orr (1940) in the Sacramento Valley indicated foraging ranges of up to 400 feet from cover.



V_8 Distance to permanent water source of year-round source of succulent vegetation.

Assumption: Habitat contained in a year-round water source which sustains succulent preferred vegetation is highly suitable for desert cottontails (Fitch 1947). Based on a maximum home range of 15 areas (Fitch 1947), a water source at the center of the home range would be approximately 400 feet to any edge of the home range.



Equations:

a) Equation for food component

Cover Type	Equation
F,N,S	$V_1(V_7 \times V_8)^{1/2}$
W,R,H,A,V	$(V_7 \times V_8)^{1/2}(V_1 + V_2)$ where $(V_1 + V_2$ does not exceed 1.0
C,G,P	$(V_7 \times V_8)^{1/2} (V_1 \times V_6)^{1/2}$

b) Equation for cover component

P,N,S	$(V_5 \times V_4)^{1/2}$
W,R,H,A,V	$V_5(V_3 + V_4)$ where $(V_3 + V_4)$ does not exceed 1.0
M	$V_3(V_5 \times V_7)^{1/2}$

c) HSI determination

The HSI value for the desert cottontail is equal to the lowest of the values for the food and cover components..

Additional Assumption:

1. Desert cottontails nest in a variety of situations including bases of trees, hollow logs, burrows below ground,. Tall grass, and some man-made structures (Fitch 1947). For purposes of this model, it is assumed that nesting cover is not limiting and is present if other cover requirements are met.

2. Water quality in the Central Valley is not limiting desert cottontails. Concentrations of heavy metals in the Central Valley are not limiting cottontail populations, except where concentrations are known from previous studies to be toxic.

3. This model was constructed for use in plant communities found in the Central Valley up to about 500 feet in elevation.

4. The minimum habitat area is defined a the minimum amount of contiguous habitat that is required before a species will live and reproduce in an area. Since the desert cottontail requires dense cover for protection and prefers to forage near the edge of cover, the minimum habitat area for this species can very greatly. Ingles (1941), suggested that the female rabbit often requires less than 1 acre whereas the male may require up to 15 acres. Trippensoe (1934 in Ingles 1941) found that average home range of the desert cottontail to be one acre, whereas Allen (1939) found that the home range averaged 3.6 acres for male, and 2,2 acres for females. For purposes of this model, we have used 1 acre as the minimum habitat area.

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HABITAT SUITABILITY INDEX MODEL

SIDE-BLOTCHED LIZARD (*Uta stansburiana*)

by
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INTRODUCTION

The side-blotched lizard (*Uta stansburiana*) ranges from eastern Washington and Oregon to eastern and southern California throughout the Great Basin and the Southwest into northern Mexico at elevations below sea level to 7000 feet (Stebbins 1966). It frequents arid and semiarid regions in sandy, gravelly, or rocky places and is occasionally found on hardpan. Washes, flats and arroyos are inhabited (Stebbins 1954) as are alluvial fans and playas (Andre and MacMahon 1980) and grasslands (Bernard and Brown, 1977).

In California, three subspecies of *Uta stansburiana* are present (Stebbins 1966). In the San Joaquin Valley, *U. s. hesperis* was the only species found in the valley bottomlands along the western bank of the San Joaquin River on the higher, rolling topography not susceptible to seasonal flooding (Montanucci 1968). In seasonally inundated areas, rolling topography may aid survival (Montanucci 1968).

MODEL APPLICABILITY

This model was designed for use in the southern Central Valley of California and surrounding foothills up to an elevation of 1500 feet for *U. s. stejnegeri* and *U. s. hesperis*.

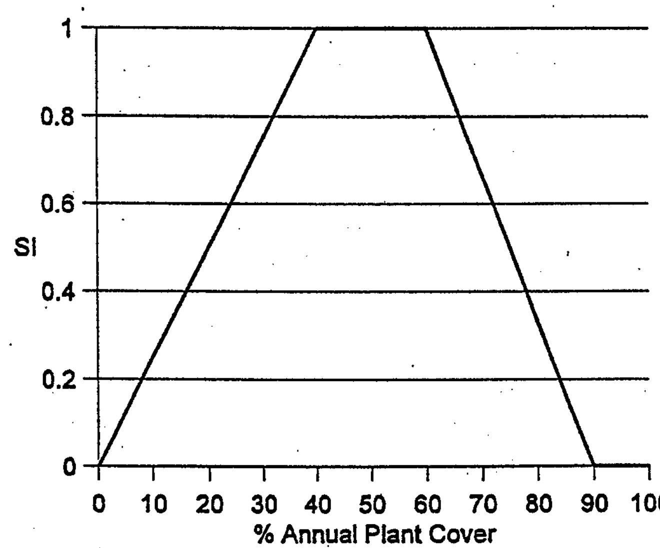
Cover Type	Life Requisite	Habitat Variable
	Feeding-------------------------	Percent ground cover. of annual plants (V_1)
Seasonal wetland (W)		
Alkali playa (P)		Percent ground cover of perennial plants (V_2)
Annual grassland (G)	Cover/Thermoregulation/	
	\	Abundance of animal burrows (V_3)

Habitat Variable	Cover Type	Suggested Techniques
V_1 Percent cover of annual plants	P,G,W	Line intercept, measurement of random points using a 3 feet diameter loop or 1 m^2 quadrat.
V_2 Percent cover of perennial plants	P,G,W	Line intercept, measurement of random points using a 3 feet diameter loop or 1 m^2 quadrat.
V_3 Abundance of animal burrows	P,G,W	Ocular estimate, belt transect.

Variable 1. Percent cover of annual plants.

Includes those plants of a grassy or herbaceous nature which fail to continuously metabolize through two or more years. This variable is intended to relate directly to abundance of arthropods which are the side-blotched lizard's primary prey. The most significant environmental factor on side-blotched lizard egg production is winter rainfall (Turner et al. 1982). Increased rainfall results in increased production of annual plants which, In turn, leads to a greater insect prey resource (Turner et al. 1982). Parker and Pianka (1975) and Worthington (1982) found the same relationship to be true. Turner et al. (1974) found *Utas* occupying irrigated areas with increased annual plant production registered greater body weight gain and produced more eggs than in non-irrigated areas. Therefore, it can be assumed that, particularly in areas without substantial persistent ground cover, the amount of annual plant growth in an area is a good indicator of the quality of the habitat for the side-blotched lizard.

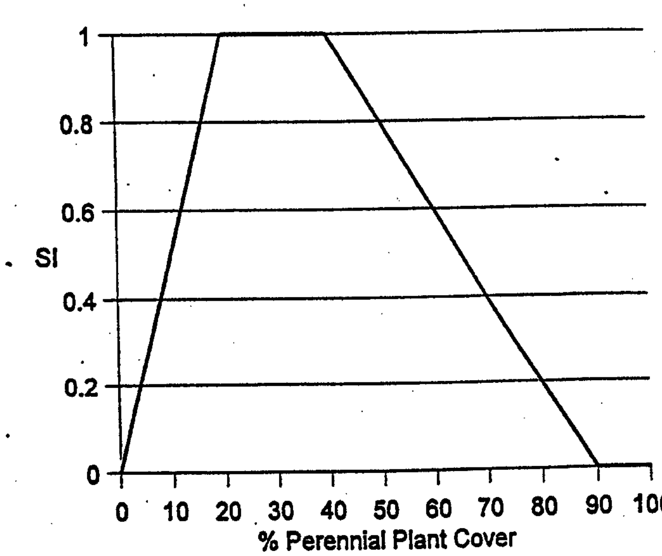
A ground cover of annual plants ranging from 40 to 60 percent is considered optimal for side-blotched lizards as it provides sufficient foliage to support arthropod prey while not being so abundant as to interfere with movement and foraging ability. An area of annual plant cover exceeding 90 percent is considered uninhabitable by *Uta* as it limits thermoregulation and foraging ability,



Variable 2. Percent cover of perennial plants.

Includes those plants which continuously metabolize throughout two or more years. This variable is intended to relate directly to the ability of the side-blotched lizard to thermoregulate and to avoid predators. Lizards are ectothermic organisms using adaptive behavior and orientation to, or avoidance of, direct sunlight to regulate body temperature. In arid areas without persistent ground cover, *Utas* may depend on shrubs or other perennial plants to avoid overexposure to mid-day sun. In the desert, *Uta* are found on small mounds around the bases of nearly any species of perennial plant (Pianka and Parker 1975). Waldschmidt (1980) suggested that shuttling between sun and shade is a major component of lizard thermoregulation. Side-blotched lizards were noted to congregate under thistle *(Salsola pestifer)* during summer days and were found where cover can be rapidly reached when danger threatened (Smith 1946). In rocky areas, *Uta* shifted to the shaded side of rocks to avoid the sun's rays (Davis and Verbeek. 1972). Other perennials with which *Uta* was found to associate include juniper *(Juniperus osteosperma)* (Waldschmidt and Tracy, 1983), bunchgrass *(Sporobolus* sp.) (Fox, 1978), budscale (*Atriplex* sp.), and sage *(Artemesia spinescens)* (Essghaier and Johnson, 1975).

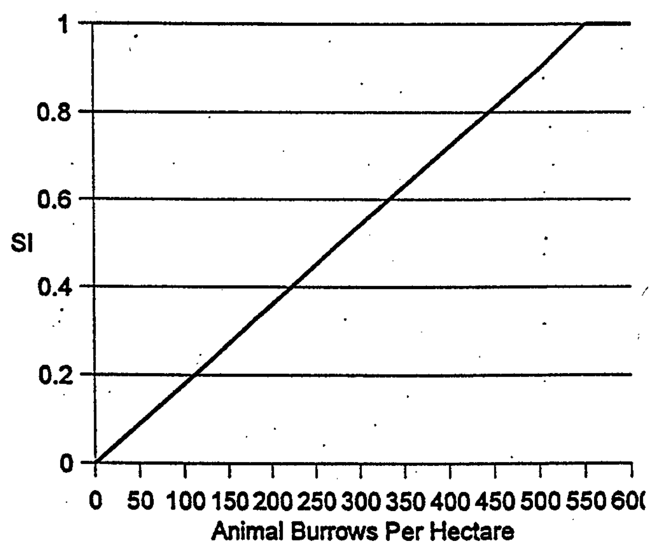
Conversely, dense vegetation can interfere with foraging ability of side-blotched lizards, In the San Joaquin Valley, *Uta* were found most abundantly on exposed terrain which would permit foraging (Montanucci 1968). Essghaier and Johnson (1975), Fox (1978), Tinkle (1980), Waldschmidt (1977) and Waldschmidt and Tracy (1983) all found *Uta* inhabiting areas of 20 percent cover and 80 percent bare ground. Davis and Verbeek (1972), Fox et al. (1981), and Tinkle (1967) found *Uta* to avoid dense grassland, though Bernard and Brown (1977) included grassland as *Uta* habitat. A reduction of shrub cover and an increase in grass cover appeared to improve habitat for *Uta* (Peterson and Whitford 1987). Perennial plant cover ranging from 20-40 percent is considered optimum side-blotched lizard habitat as it allows for maximum foraging area and exposure to the sun while providing sufficient perennial plant shade for thermoregulation. Perennial plant cover exceeding 90 percent is considered uninhabitable for *Uta* as it limits thermoregulation and foraging ability.



Variable 3. Abundance of animal burrows.

Includes burrows dug by burrowing mammals and Insects. Burrows provide supplementary cover for thermoregulation, predator avoidance and as sites for egg laying in areas where necessary cover is otherwise lacking. Tinkle (1967) found kangaroo rat *(Dipodomys* spp.) burrows an important cover type for side-blotched lizards. Taking shelter in a rodent or insect burrow is a common means of thermoregulation in *Uta* (Davis and Verbeek, 1972). A lack of mammal burrows contributes to lower *Uta* densities (Parker 1974). The presence of rocks, mammal burrows or shrubs is always a common feature of *Uta* habitat (Bernard and Brown, 1977; Tinkle, 1967).

An animal burrow is defined as a ground opening created by a burrowing mammal or insect which is large enough for a side-blotched lizard to enter and remain without being visible to a standing observer. To determine the number of animal burrows that could be considered optimal for *Uta* it was assumed that, wherever an *Uta* is on a site at carrying capacity, there should be a burrow within 10 feet. This would yield one burrow at least every 200 square feet or 550 burrows per hectare.



This model was designed for areas in which rocks were not of sufficient number to be considered a significant cover type. If this model is to be adapted to evaluate habitats in which rocks are present in sufficient quantity to provide significant cover for *Uta* then the model may need to be altered to reflect this.

CALCULATIONS

Life Requisite	Cover Type	Index and Equation
Feeding	P,G,W	$F1 = V_1$
Cover/Thermoregulation	P,G,W	$C1 = (V_2 + V_3)$

HSI Determination

$$HSI = \frac{(FI + CI)}{2}$$

An FI, CI, or HSI value of 1.0 is considered optimal. Any value greater than 1.0 achieved through the use of this formula should be considered 1.0.

ASSUMPTIONS

It is assumed that where all necessary habitat components are present, food availability is not a factor limiting the use of an area by side-blotched lizards. These lizards spend little time actively foraging and are opportunistic feeders (Peterson and Whitford 1987) which will eat almost any insect of suitable size that passes near them (Tinkle 1967). Food items vary greatly throughout the year and by area (Smith 1946). This indicates the opportunistic nature of *Uta*. Stebbins (1954) described *Uta* as feeding on 22 types of arthropods. The most common groups preyed upon include ants, beetles, true bugs, grasshoppers, spiders, termites, bees, crickets and caterpillars (Best and Gennaro 1984; Parker and Piank 1975; Smith, 1946; Tinkle, 1967). In this model, it is assumed that food availability is not a limiting factor in suitable habitat conditions.

Reproduction

Side-blotched lizard eggs are probably buried by females in sand or damp, friable soil at the base of cover plants or in other locations providing some humidity and protection from direct sun. Mautz (1982) found *Uta* to place its eggs beneath a rock. The laying of multiple clutches by *Uta* has been well established (Bakewell et al . 1983; Turner et al. 1974; 1982) though there is much variability in number and size of clutches layed. The number of clutches laid per year has been found to range from one to seven, depending on environmental conditions. Older females (>12 months old) lay more and larger clutches (Andre and MacMahon 1980; Medica and Turner 1976). Worthington (1982) and Turner et al. (1974) found a positive correlation between rainfall and increased clutch size.

Water requirements

Considering the wide distribution of this species in many arid habitats including desert regions, it is unlikely that water availability is a factor limiting habitat suitability. This assumes that sufficient ground cover exists for thermoregulation and nesting.

ACKNOWLEDGMENTS

We thank Philip A. Medica, Ph.D, Mercury, Nevada and Frederick B. Turner, University of California, Los Angeles for reviewing the draft model and for providing field observations, data and suggest-ions which aided in establishing field applicability of the model. Their contributions are greatly appreciated.

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WESTERN MEADOWLARK

HABITAT SUITABILITY INDEX MODEL

The western meadowlark (Sturnella neglecta) is a common resident throughout suitable habitat in California (Small 1974), from sea level to 7,000 feet (Bryant 1914). It is commonly associated with grasslands, meadows, savannas, and grassy parks (Small 1974), though other similar habitats say also be used.

Loose flocks of 5 to 75 meadowlarks form throughout fall and winter (Bryant1914; Grinnell &ad Starer 1924). In spring and early summer, they are commonly seen singly or in pairs. This bird is highly praised by many for it's melodious song and diet of insects which are harmful to agriculture (Grinn 11 and Storer1524; Bailey 1928; Bent 1958; Seymour 1976).

Food Requirements

The annual diet of the western meadowlark is roughly comprised of 70 percent animal matter and 30 percent vegetative material (Bryant 1914; Bent 1959; Martin et al. 1961; Seymour 1976); ranging from 45 percent animal matter in winter to 96 percent of the same in summer (Martin et al. 1961).

Bryant (1914) analyzed the stomach contents of nearly 2,000 western meadowlarks in California and reports the following annual diet:

ANIMAL		VEGETABLE	
Beetles (Coleoptera)	21.3%	Grain	30.8%
Grasshoppers and Crickets (Orthoptera)	20.3	Weed Seed	6.3
Butterflies and Moths (Lepidoptera)	12.2	Misc.	0.6
Ants, Bees, and Wasps (Hymenoptera)	5.6	TOTAL	36.7%
Bugs (Hemiptera)	1.7		
Spiders (Arachnida)	0.2		
Flies (Diptera)	0.1		
Misc. Insects	1.9		
TOTAL	63.3%		

Wild oats (Avena fatua) constitute about 70 percent of the grains consumed by meadowlarks. In diminishing order of importance, barley, wheat, and corn make up the remainder of grains taken. When grains are not readily available, seeds of wood and forage plants form the principal part of this bird's vegetable diet, especially the seeds of filaree (Irodium app.). In lesser amounts, the western meadowlark also consumes seeds of tarweed, mustard, tumbleweed, Napa thistle, pigweed, amaranth, canary grass, Johnson grass, foxtail, burrclover, and sunflower.

Bryant's study (op. cit.) also revealed seasonal fluctuations of insect consumption. Beetles were eaten year-around, while grasshoppers and crickets were seasonally taken; accounting for up to 85 percent of the diet in August. Butterfly and moth larvae constituted 33 percent of the total diet during the peak months of May and June. Despite the availability of grain and weed seeds during the brooding period, nestlings are fed almost entirely on insects (95.7%); largely cutworms, grasshoppers and ground-beetles.

Water Requirements

The western meadowlark is ecologically separated from it's eastern counterpart (S. magna) by it's preference for a drier environmental moisture regime (Lanyon 1953, 1956, 11057). As a xeric adapted bird, the western meadowlark responds to low water availability by limited physiological reductions in both water needs and losses (Pierce 1975). However, captive birds consumed large quantities of water when it was readily available. According to Bailey (1928), meadowlarks in New Mexico require but two things, open country and water.

Cover Requirements

Although the western meadowlark is primarily a grassland species (Miller 1951), it is also commonly found in meadows, savannas, and grassy parks (Small 1974); pastures and field crops (Bryant 1914); marshes and grass-brush ecotones (Thomas 1979); open fields (Peterson 1961); and the grassy understory of the oak-cottonwood phase of riparian forests (Gaines 1977). Grassland avian species often show a secondary affinity for freshwater marshes; largely because of the proximity and resemblance in life-form of the plants involved in these two habitats (Miller 1951). Meadowlarks have been found in a variety of plant associations (Lanyon 1957) so long as there occurs a dense growth of grasses and weeds (Bent 1958). Hence, this literature review indicates that the western meadowlark is primarily a grassland species, but my utilize any physiognomically similar habitat.

Bryant (1914) observed a strong preference of meadowlarks for uncultivated pasture (71.2%) over cultivated grain and alfalfa fields (28.8%). The local abundance of this bird is largely affected by the supply of favored insects, which are more readily available in uncultivated grassy pastureland than in orchards or grain fields.

Meadowlarks in Iowa seek nocturnal cover by roosting on the ground beneath a clump of grass (Kendeigh 1941). Mid-day diurnal cover is sought beneath the shade of tall grasses, while open fields are avoided during these hot periods (Bryant 1914). Meadowlarks seldom perch in trees and forage almost exclusively on the ground.

Reproduction Requirements

In California, the meadowlark prefers to build it's nest in open pasture and grasslands (Seymour 1976) including alfalfa and grain fields (Bryant 1914). When available, pastureland was preferred for nest sites in Bryant's study (1914:p4O4) with "... at least eighty per cent of the nests found being so situated". The globular nest is usually built of dry grasses and weeds, upon a

depression in the ground, with a domed canopy of like material woven into the surrounding vegetation (Bent 1958; Seymour 1976). A carefully concealed runway, from 0.6 - 1.5 m (2 - 5 ft), leads to a small opening on the side of the nest.

The nesting season is a long one, from March to August (Bryant 1914). This is so because of the meadowlark's renesting habit; bringing off a second brood sometime from July to August to off-set high nest predation. Both sexes are good singers and usually do so from an elevated perch site. Such sites include fence posts, shrubs, and clods (Bryant op. cit.); boulders and trees (Grinnell and Storer 1924); earthen mounds and telephone poles or wires (author, personal observation); and tall weeds (Kendeigh 1941). These birds will occasionally sing from the ground (Grinnell and Storer 1924), though elevated perch sites are presumably preferred.

Special Habitat Requirements

No information was found in the literature regarding habitat requirements of western meadowlarks.

Interspersion Requirements

No information was found in the literature regarding habitat requirements of western meadowlarks.

Baily (1928) cites "open country" as a requirement of western meadowlarks. This indicates a possible requirement for a minimum amount of habitat Interspersion. However, the extent of "open country", as a requirement, appears to be rather small. Meadowlarks are often found in small grassy valleys of the Hudsonian zone at higher elevations (Grinnell and Storer 1924; Bailey 1928; Bent 1958). Hence, for all practical purposes, meadowlarks appear to tolerate habitat interspersion so long as open grass or pastureland is available.

Special Considerations

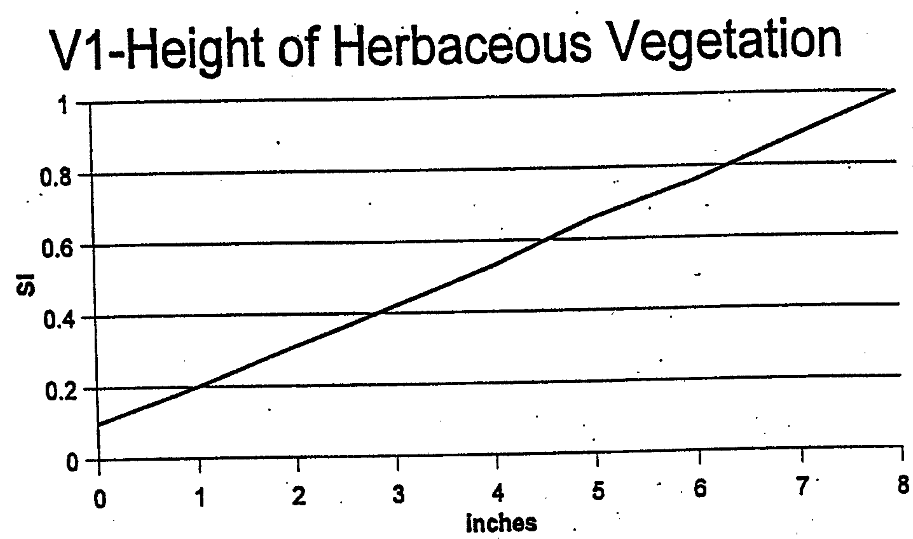
This species has thus far benefitted from man's expansion into the west. Reclamation projects in the Central Valley have converted such wetland acreage to agricultural fields. Such clearing and cultivation has resulted in increased habitat for meadowlarks (Bryant 1914). Most authorities agree that the small amount of cultivated grains taken by this bird is well off-set by the number of agriculturally harmful insects consumed. Light or winter grazing has little effect upon meadowlark habitat, though heavy or summer grazing is detrimental (Weins 1973). Grazing cattle may also destroy nests beneath their feet (Bent 1958).

Dispersion

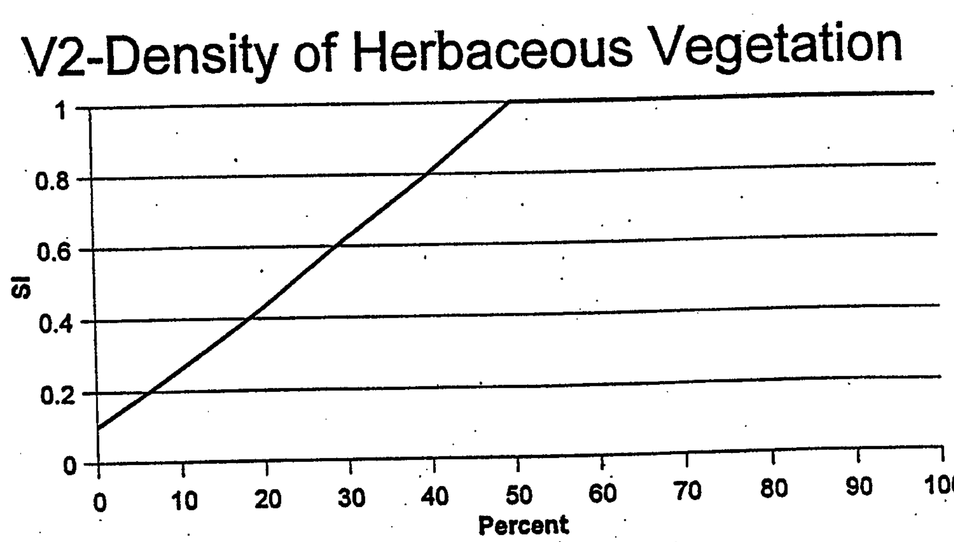
Male meadowlarks actively defend territories (Kendeigh 1941; Lanyon 1957; Seymour 1976), however information in the literature regarding the size of territories is limited. In his study of the birds of a prairie community in Iowa, Kendeigh (1941) reports territories of 10, 21, 24, and 32 acres (4.0 -13.0 ha; x = 8.8 ha or 21.8 ac). In Wisconsin, Lanyon (1957) reports territory sizes

1.2 - 6.1 ha (3-15 ac), commonly 2.8 - 3.2 ha (7 - 8 ac). For the purpose of the following Habitat Evaluation Criteria, a practical territory size of 6.1 ha (15 ac) will be assumed for the western meadowlark; computed as the mean of the above cited territory sizes.

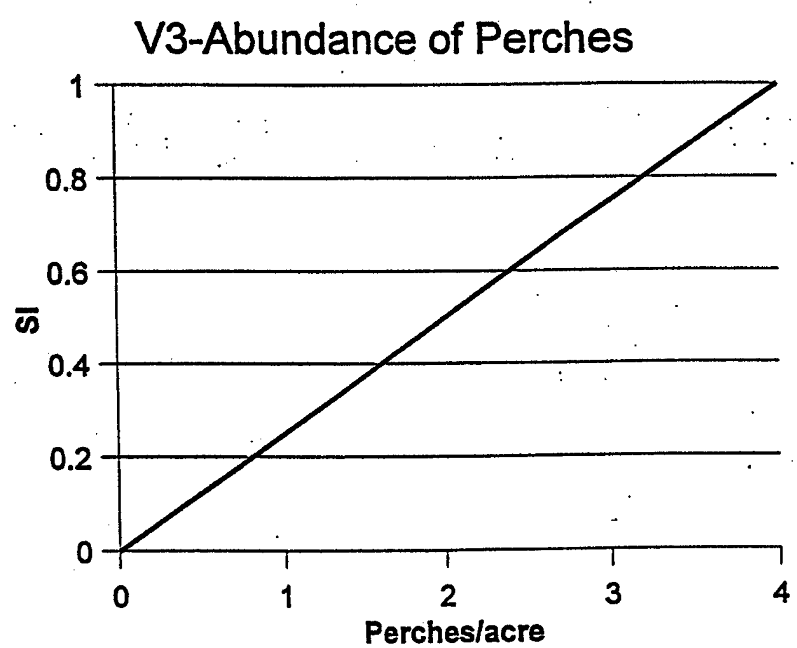
V1-Height of Herbaceous Vegetation



V2-Density of Herbaceous Vegetation



V3-Abundance of Singing Perches



$HSI = [(V1*V2)^{1/2} + V3]/2$

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APPENDIX B

LETTER FROM FWS REGARDING THREATENED AND ENDANGERED SPECIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

IN REPLY REFER TO:
1-1-01-SP-0935

January 31, 2001

Debbie Giglio
Department of the Army
US Army Engineer District, Sacramento
1325 J Street
Sacramento, California 95814-2922

Subject: Species List for Habitat Restoration Along Lower Kings River, Fresno County, California

Dear Ms. Giglio:

We are sending the enclosed list in response to your January 25, 2001, request for information about endangered and threatened species (Enclosure A). The list covers the following U.S. Geological Survey 7½ minute quad or quads: Sacate Ridge, Luckett Mtn, Trimmer, Pine Flat Dam.

Please read *Important Information About Your Species List* (enclosed). It explains how we made the list and describes your responsibilities under the Endangered Species Act. Please contact Harry Mossman, Biological Technician, at (916) 414-6650, if you have any questions about the attached list or your responsibilities under the Endangered Species Act. For the fastest response to species list requests, address them to the attention of Mr. Mossman at this address. You may fax requests to him at 414-6710 or 6711.

Sincerely,

for Jan C. Knight
Chief, Endangered Species Division

Enclosures

Important Information
About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute *quads*. The United States is divided into these quads, which are about the size of San Francisco. If you requested your list by quad name or number, that is what we used. Otherwise, we used the information you sent us to determine which quad or quads to use.

Animals

The animals on your species list are ones that occur within, *or may be affected by projects within*, the quads covered by the list. Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.

Plants

Any plants on your list are ones *that have actually been observed* in the quad or quads covered by the list. We have also included either a county species list or a list of species in nearby quads. We recommend that you check your project area for these plants. Plants may exist in an area without ever having been detected there.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. For plant surveys, we recommend using the enclosed *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Species*. The results of your surveys should be published in any environmental documents prepared for your project.

State-Listed Species

If a species has been listed as threatened or endangered by the State of California, but not by us nor by the National Marine Fisheries Service, it will appear on your list as a Species of Concern. *However you should contact the California Department of Fish and Game for official information about these species.* Call (916) 322-2493 or write Marketing Manager, California Department of Fish and Game, Natural Diversity Data Base, 1416 Ninth Street, Sacramento, California 95814.

Your Responsibilities Under the Endangered Species Act

All plants and animals identified as *listed* on Enclosure A are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the *take* of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt,

shoot, wound, kill, trap, capture, or collect" any such animal. Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a *formal consultation* with the Service. Such consultation would result in a *biological opinion* addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an *incidental take permit*. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project. Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that mitigates for the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the mitigation plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as *critical habitat*. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Maps and boundary descriptions of the critical habitat may be found in the *Federal Register*. The information is also reprinted in the *Code of Federal Regulations* (50 CFR 17.95).

Candidate Species

We recommend that you address impacts to *candidate* species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Your list may contain a section called *Species of Concern*. This term includes former *category 2*

candidate species and other plants and animals of concern to the Service and other Federal, State and private conservation agencies and organizations. Some of these species may become candidate species in the future.

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed, candidate and special concern species in your planning, this should not be a problem. We also continually strive to make our information as accurate as possible. Sometimes we learn that a particular species has a different range than we thought. This should not be a problem if you consider the species on the county or surrounding-quad lists that we have enclosed. If you have a long-term project or if your project is delayed, please feel free to contact us about getting a current list. You can also find out the current status of a species by going to the Service's Internet page: *www.fws.gov*

GUIDELINES FOR CONDUCTING AND REPORTING BOTANICAL INVENTORIES FOR FEDERALLY LISTED, PROPOSED AND CANDIDATE PLANTS
(September 23, 1996)

These guidelines describe protocols for conducting botanical inventories for federally listed, proposed and candidate plants, and describe minimum standards for reporting results. The Service will use, in part, the information outlined below in determining whether the project under consideration may affect any listed, proposed or candidate plants, and in determining the direct, indirect, and cumulative effects.

Field inventories should be conducted in a manner that will locate listed, proposed, or candidate species (target species) that may be present. The entire project area requires a botanical inventory, except developed agricultural lands. The field investigator(s) should:

1. Conduct inventories at the appropriate times of year when target species are present and identifiable. Inventories will include all potential habitats. Multiple site visits during a field season may be necessary to make observations during the appropriate phenological stage of all target species.

2. If available, use a regional or local reference population to obtain a visual image of the target species and associated habitat(s). If access to reference populations is not available, investigators should study specimens from local herbaria.

3. List every species observed and compile a comprehensive list of vascular plants for the entire project site. Vascular plants need to be identified to a taxonomic level which allows rarity to be determined.

4. Report results of botanical field inventories that include:

   a. a description of the biological setting, including plant community, topography, soils, potential habitat of target species, and an evaluation of environmental conditions, such as timing or quantity of rainfall, which may influence the performance and expression of target species

   b. a map of project location showing scale, orientation, project boundaries, parcel size, and map quadrangle name

   c. survey dates and survey methodology(ies)

   d. if a reference population is available, provide a written narrative describing the target species reference population(s) used, and date(s) when observations were made

   e. a comprehensive list of all vascular plants occurring on the project site for each habitat type

   f. current and historic land uses of the habitat(s) and degree of site alteration

   g. presence of target species off-site on adjacent parcels, if known

   h. an assessment of the biological significance or ecological quality of the project site in a local

and regional context

5. If target species is(are) found, report results that additionally include:

    a. a map showing federally listed, proposed and candidate species distribution as they relate to the proposed project

    b. if target species is (are) associated with wetlands, a description of the direction and integrity of flow of surface hydrology. If target species is (are) affected by adjacent off-site hydrological influences, describe these factors.

    c. the target species phenology and microhabitat, an estimate of the number of individuals of each target species per unit area; identify areas of high, medium and low density of target species over the project site, and provide acres of occupied habitat of target species. Investigators could provide color slides, photos or color copies of photos of target species or representative habitats to support information or descriptions contained in reports.

    d. the degree of impact(s), if any, of the proposed project as it relates to the potential unoccupied habitat of target habitat.

6. Document findings of target species by completing California Native Species Field Survey Form(s) and submit form(s) to the Natural Diversity Data Base. Documentation of determinations and/or voucher specimens may be useful in cases of taxonomic ambiguities, habitat or range extensions.

7. Report as an addendum to the original survey, any change in abundance and distribution of target plants in subsequent years. Project sites with inventories older than three years from the current date of project proposal submission will likely need additional survey. Investigators need to assess whether an additional survey(s) is (are) needed.

8. Adverse conditions may prevent investigator(s) from determining presence or identifying some target species in potential habitat(s) of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any year. An additional botanical inventory(ies) in a subsequent year(s) may be required if adverse conditions occur in a potential habitat(s). Investigator(s) may need to discuss such conditions.

9. Guidance from California Department of Fish and Game (CDFG) regarding plant and plant community surveys can be found in Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities, 1984. Please contact the CDFG Regional Office for questions regarding the CDFG guidelines and for assistance in determining any applicable State regulatory requirements.

ATTACHMENT A

Endangered and Threatened Species that May Occur in or be Affected by Projects in the Selected Quads Listed Below

January 31, 2001

QUAD : 376B SACATE RIDGE

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Species of Concern

Mammals

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

American (=pine) marten, *Martes americana* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Sierra Nevada red fox, *Vulpes vulpes necator* (CA)

Birds

northern goshawk, *Accipiter gentilis* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

QUAD : 376C LUCKETT MTN.

Listed Species

Birds

California condor, *Gymnogyps californianus* (E)

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

American (=pine) marten, *Martes americana* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Sierra Nevada red fox, *Vulpes vulpes necator* (CA)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

QUAD : 377A TRIMMER

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

Dry Creek cliff strider bug, *Oravelia pege* (SC)

Plants

carpenteria, *Carpenteria californica* (CA)

orange lupine, *Lupinus citrinus var. citrinus* (SC)

QUAD : 377D PINE FLAT DAM

Listed Species

Birds

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Species of Concern

Mammals

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

American peregrine falcon, *Falco peregrinus anatum* (D)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

molestan blister beetle, *Lytta molesta* (SC)

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	*Proposed Critical Habitat*	Proposed as an area essential to the conservation of the species.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	May be endangered or threatened. Not enough biological information has been gathered to support listing at this time.
(MB)	*Migratory Bird*	Migratory bird
(D)	*Delisted*	Delisted. Status to be monitored for 5 years.
(CA)	*State-Listed*	Listed as threatened or endangered by the State of California.
(*)	*Extirpated*	Possibly extirpated from this quad.
(**)	*Extinct*	Possibly extinct.
	Critical Habitat	Area essential to the conservation of a species.

ATTACHMENT A

Endangered and Threatened Species that May Occur in or be Affected by

PROJECTS IN FRESNO COUNTY

Reference File No. 1-1-01-SP-0935

January 31, 2001

Listed Species

Mammals

giant kangaroo rat, *Dipodomys ingens* (E)

Critical habitat, Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E)

Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E)

Tipton kangaroo rat, *Dipodomys nitratoides nitratoides* (E)

Sierra Nevada (=California) bighorn sheep, *Ovis canadensis californiana* (E)

San Joaquin kit fox, *Vulpes macrotis mutica* (E)

riparian (San Joaquin Valley) woodrat, *Neotoma fuscipes riparia* (E) *

Birds

California condor, *Gymnogyps californianus* (E)

Aleutian Canada goose, *Branta canadensis leucopareia* (T)

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

blunt-nosed leopard lizard, *Gambelia (=Crotaphytus) sila* (E)

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Lahontan cutthroat trout, *Oncorhynchus (=Salmo) clarki henshawi* (T)

Paiute cutthroat trout, *Oncorhynchus (=Salmo) clarki seleniris* (T)

Central Valley steelhead, *Oncorhynchus mykiss* (T)

Sacramento splittail, *Pogonichthys macrolepidotus* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Plants

California jewelflower, *Caulanthus californicus* (E)

palmate-bracted bird's-beak, *Cordylanthus palmatus* (E)

San Joaquin woolly-threads, *Lembertia congdonii* (E)

Hartweg's golden sunburst, *Pseudobahia bahiifolia* (E)

San Benito evening-primrose, *Camissonia benitensis* (T)

fleshy owl's-clover, *Castilleja campestris ssp. succulenta* (T)

Hoover's eriastrum (= woolly-star), *Eriastrum hooveri* (T)

San Joaquin Valley Orcutt grass, *Orcuttia inaequalis* (T)

San Joaquin adobe sunburst, *Pseudobahia peirsonii* (T)

Greene's tuctoria, *Tuctoria greenei* (E) *

Proposed Species

Birds

mountain plover, *Charadrius montanus* (PT)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Species of Concern

Mammals

San Joaquin (=Nelson's) antelope squirrel, *Ammospermophilus nelsoni* (CA)

California wolverine, *Gulo gulo luteus* (CA)

Sierra Nevada red fox, *Vulpes vulpes necator* (CA)

pale Townsend's big-eared bat, *Corynorhinus (=Plecotus) townsendii pallescens* (SC)

Pacific western big-eared bat, *Corynorhinus (=Plecotus) townsendii townsendii* (SC)

short-nosed kangaroo rat, *Dipodomys nitratoides brevinasus* (SC)

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

American (=pine) marten, *Martes americana* (SC)

Pacific fisher, *Martes pennanti pacifica* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Tulare grasshopper mouse, *Onychomys torridus tularensis* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

Mt. Lyell shrew, *Sorex lyelli* (SC)

Birds

Swainson's hawk, *Buteo Swainsoni* (CA)

little willow flycatcher, *Empidonax traillii brewsteri* (CA)

greater sandhill crane, *Grus canadensis tabida* (CA)

bank swallow, *Riparia riparia* (CA)
American peregrine falcon, *Falco peregrinus anatum* (D)
Black-Crowned Night Heron, *Nycticorax nycticorax* (MB)
northern goshawk, *Accipiter gentilis* (SC)
tricolored blackbird, *Agelaius tricolor* (SC)
grasshopper sparrow, *Ammodramus savannarum* (SC)
short-eared owl, *Asio flammeus* (SC)
western burrowing owl, *Athene cunicularia hypugea* (SC)
American bittern, *Botaurus lentiginosus* (SC)
ferruginous hawk, *Buteo regalis* (SC)
Costa's hummingbird, *Calypte costae* (SC)
Lawrence's goldfinch, *Carduelis lawrencei* (SC)
Vaux's swift, *Chaetura vauxi* (SC)
lark sparrow, *Chondestes grammacus* (SC)
olive-sided flycatcher, *Contopus cooperi* (SC)
black swift, *Cypseloides niger* (SC)
hermit warbler, *Dendroica occidentalis* (SC)
white-tailed (=black shouldered) kite, *Elanus leucurus* (SC)
Pacific-slope flycatcher, *Empidonax difficilis* (SC)
least bittern, western, *Ixobrychus exilis hesperis* (SC)
loggerhead shrike, *Lanius ludovicianus* (SC)
Lewis' woodpecker, *Melanerpes lewis* (SC)
long-billed curlew, *Numenius americanus* (SC)
white-faced ibis, *Plegadis chihi* (SC)
rufous hummingbird, *Selasphorus rufus* (SC)
red-breasted sapsucker, *Sphyrapicus ruber* (SC)
Brewer's sparrow, *Spizella breweri* (SC)
California spotted owl, *Strix occidentalis occidentalis* (SC)
Bewick's wren, *Thryomanes bewickii* (SC)

Reptiles

silvery legless lizard, *Anniella pulchra pulchra* (SC)
northwestern pond turtle, *Clemmys marmorata marmorata* (SC)
southwestern pond turtle, *Clemmys marmorata pallida* (SC)
San Joaquin coachwhip (=whipsnake), *Masticophis flagellum ruddocki* (SC)
California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

Yosemite toad, *Bufo canorus* (SC)

Mount Lyell salamander, *Hydromantes platycephalus* (SC)
foothill yellow-legged frog, *Rana boylii* (SC)
mountain yellow-legged frog, *Rana muscosa* (SC)
western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)
river lamprey, *Lampetra ayresi* (SC)
Kern brook lamprey, *Lampetra hubbsi* (SC)
Pacific lamprey, *Lampetra tridentata* (SC)
longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Ciervo aegialian scarab beetle, *Aegialia concinna* (SC)
San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)
San Joaquin dune beetle, *Coelus gracilis* (SC)
Kings Canyon cryptochian caddisfly, *Cryptochia excella* (SC)
Wooly hydroporus diving beetle, *Hydroporus hirsutus* (SC)
California linderiella fairy shrimp, *Linderiella occidentalis* (SC)
Hopping's blister beetle, *Lytta hoppingi* (SC)
moestan blister beetle, *Lytta moesta* (SC)
molestan blister beetle, *Lytta molesta* (SC)
Morrison's blister beetle, *Lytta morrisoni* (SC)
Dry Creek cliff strider bug, *Oravelia pege* (SC)
Bohart's blue butterfly, *Philotiella speciosa bohartorum* (SC)
Sierra pygmy grasshopper, *Tetrix sierrana* (SC)

Plants

carpenteria, *Carpenteria californica* (CA)
obovate-leaved thornmint, *Acanthomintha obovata ssp. obovata* (SC)
forked fiddleneck, *Amsinckia vernicosa var. furcata* (SC)
Bodie Hills rock-cress, *Arabis bodiensis* (SC)
Raven's milk-vetch, *Astragalus monoensis var. ravenii* (SC)
heartscale, *Atriplex cordulata* (SC)
brittlescale, *Atriplex depressa* (SC)
Lost Hills saltbush, *Atriplex vallicola* (SC)
South Coast Range morning-glory, *Calystegia collina ssp. venusta* (SC)
Mono Hot Springs evening-primrose, *Camissonia sierrae ssp. alticola* (SC)
San Benito spineflower, *Chorizanthe biloba var. immemora* (SC)
Fresno County bird's-beak, *Cordylanthus tenuis ssp. barbatus* (SC)

recurved larkspur, *Delphinium recurvatum* (SC)
mouse buckwheat, *Eriogonum nudum var. murinum* (SC)
spiny-sepaled coyote-thistle, *Eryngium spinosepalum* (SC)
hollisteria, *Hollisteria lanata* (SC)
delta tule-pea, *Lathyrus jepsonii var. jepsonii* (SC)
rayless layia, *Layia discoidea* (SC)
Panoche peppergrass, *Lepidium jaredii var. album* (SC)
long-petaled lewisia, *Lewisia longipetala* (SC)
orange lupine, *Lupinus citrinus var. citrinus* (SC)
valley sagittaria, *Sagittaria sanfordii* (SC)
parasol clover, *Trifolium bolanderi* (SC)
lesser saltscale, *Atriplex minuscula* (SC) *
pale-yellow layia, *Layia heterotricha* (SC) *

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(PX)	*Proposed Critical Habitat*	Proposed as an area essential to the conservation of the species.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	Other species of concern to the Service.
(D)	*Delisted*	Delisted. Status to be monitored for 5 years.
(CA)	*State-Listed*	Listed as threatened or endangered by the State of California.
*	*Extirpated*	Possibly extirpated from the area.
**	*Extinct*	Possibly extinct
	Critical Habitat	Area essential to the conservation of a species.

APPENDIX C

BIOLOGICAL ASSESSMENT AND BIOLOGICAL DATA REPORT

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

September 19, 2000

Environmental Resources Branch

Mr. Wayne White, Field Supervisor
U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Office
3310 El Camino Avenue, Suite 130
Sacramento, California 95821-6340

Dear Mr. White:

This is our biological assessment of the effects of the proposed Pine Flat Dam Fish and Wildlife Habitat Restoration project on Federally listed and proposed species, and associated critical habitat. The project area is located at Pine Flat Dam and along the lower Kings River in Fresno County, California (Enclosure 1). The project includes (1) installing a multilevel intake structure at Pine Flat Dam to regulate release temperatures and (2) restoring 143.5 acres of riparian and oak woodland habitat near the Friant-Kern Canal siphon (Enclosure 2). The goal of the project is to restore fish and wildlife habitat along the lower Kings River.

According to August 4, 1997 (Ref #1-1-97-SP-1381), May 24, 1999 (Ref #1-1-99-SP-1327), and June 30, 2000 (Ref #1-1-00-SP-2115), letters from the U.S. Fish and Wildlife Service, the Federally listed species that could occur in the project area include the American peregrine falcon, bald eagle, California red-legged frog, delta smelt, Sacramento splittail, California condor, Valley elderberry longhorn beetle, giant garter snake, giant kangaroo rat, Fresno kangaroo rat and critical habitat, Tipton kangaroo rat, riparian (San Joaquin Valley) woodrat, San Joaquin kit fox, Aleutian Canada goose, blunt-nosed leopard lizard, Lahontan cutthroat trout, Paiute cutthroat trout, Central Valley steelhead, vernal pool fairy shrimp, vernal pool tadpole shrimp, California jewelflower, palmate-bracted bird's-beak, San Joaquin woolly-threads, Hartweg's golden sunburst, Mariposa pussy-paws, San Benito evening-primrose, fleshy owl's-clover, Hoover's eriastrum, San Joaquin Valley Orcutt grass, San Joaquin adobe sunburst, and Green's tuctoria. The Federally proposed specie is the mountain plover.

It is our biological assessment that the proposed project would have no significant adverse effects on any Federally listed species. Any bald eagles wintering at Pine Flat Reservoir near the dam would experience only minor, temporary disturbances during foraging due to construction of the multilevel intake structure. In addition, the California red-legged frog, California jewelflower, tree-anemone, and San Joaquin adobe sunburst could occur at the restoration site. Field visits have confirmed the existence of suitable habitat for these species at the site, and extensive field surveys would be conducted by qualified biologists prior to initiation

of restoration activities. However, best construction management practices would be implemented during restoration to avoid these species or their habitats. Restoration of fish and wildlife habitat in the project area would have a beneficial effect on listed species and their habitats.

We do not anticipate any adverse effects on the other identified Federally listed and proposed species because (1) they are not likely to occur in the project area due to lack of suitable habitat, (2) there are no known occurrences near the project area, and/or (3) existing habitat is far enough from the work sites that the habitat or species would not be disturbed during construction. Enclosure 3 is a copy of the Corps' draft Biological Data Report, which describes the potential effects of the project on the Federally listed and proposed endangered and threatened species, and candidate species in the project area. The water transfer pipeline is no longer being considered as an alternative or feature of the proposed project.

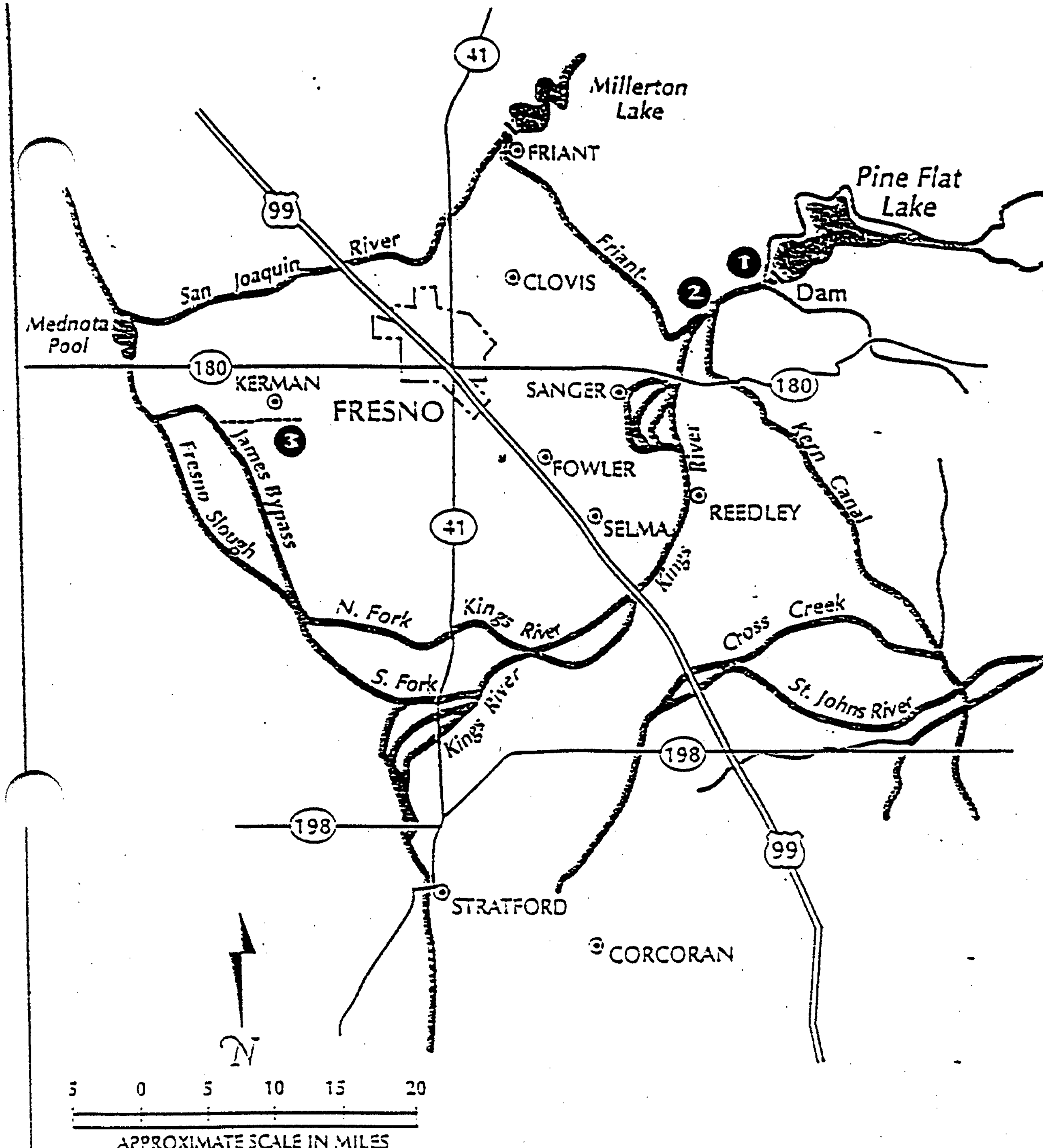
Since any effects on the bald eagle would be only temporary, and any Federally listed species and critical habitat at the restoration site would be avoided using best management practices, we request your concurrence on our determination that the proposed project would have no significant adverse effects on the Federally listed species identified in the three letters from your agency. If you have any questions, please contact Ms. Deborah Giglio, Environmental Planning Section, at (916) 557-5195.

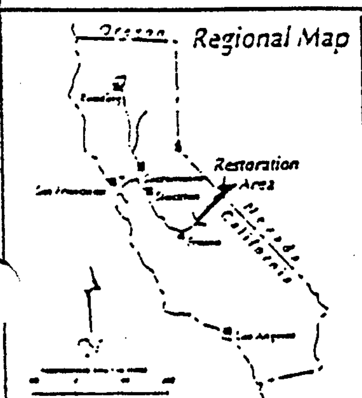
Sincerely,

Mark Capik

Mark S. Capik
Acting Chief, Planning Division

Enclosures





Legend

1. Multi-level Intake Structure
2. Friant-Kern Canal Restoration Site
3. Water Transfer Pipeline

PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

VICINITY MAP

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999

Pine Flat Dam Fish and Wildlife Habitat Restoration Project
Description of Features

Multilevel Intake Structure

The multilevel intake structure would be constructed on the upstream face of the dam (Attachment 1). The multilevel intake structure would consist of three separate steel (space frame) structures which extend from elevation 953.46 feet, mean sea level (msl), downward to elevation 616.5 feet, msl. The three separate steel structures would fit over the three existing power penstock intakes. Each of the three structures would have three port openings and gates. There would be a hoist and cable unit (including a motor) for each of the nine openings. The three port openings would be 25 feet high and 42 feet wide and would be staggered at seven different elevations that would permit selective withdrawal of water from a wide range of levels in the reservoir.

The 27-foot-high by 44-foot-wide steel gates would be constructed to close off each of the new port openings. One gate on all three of the structures would be at the same elevation, and two gates on each of the structures would be at different elevations. The gates would open in the downward direction and would sit in a structural channel when completely open. This design would take the gate loadings off the hoist cable. Cladding would be placed on the space frame to enclose each of the structures. Steel plates would be put on the bottom of each of the space frame structures to prevent water from leaking into each structure. A trashrack would be placed on the front face of each of the structures to prevent any large debris from entering the port openings and to protect the structure.

This alternative would allow water at various elevations and temperatures in the reservoir to be combined when released through the dam to the downstream channel. Mixing water from various elevations in the reservoir would preserve the cold water in the reservoir and promote downstream water temperatures suitable to sustain the trout fishery throughout the year, especially in the late summer and fall when the cold water can become depleted.

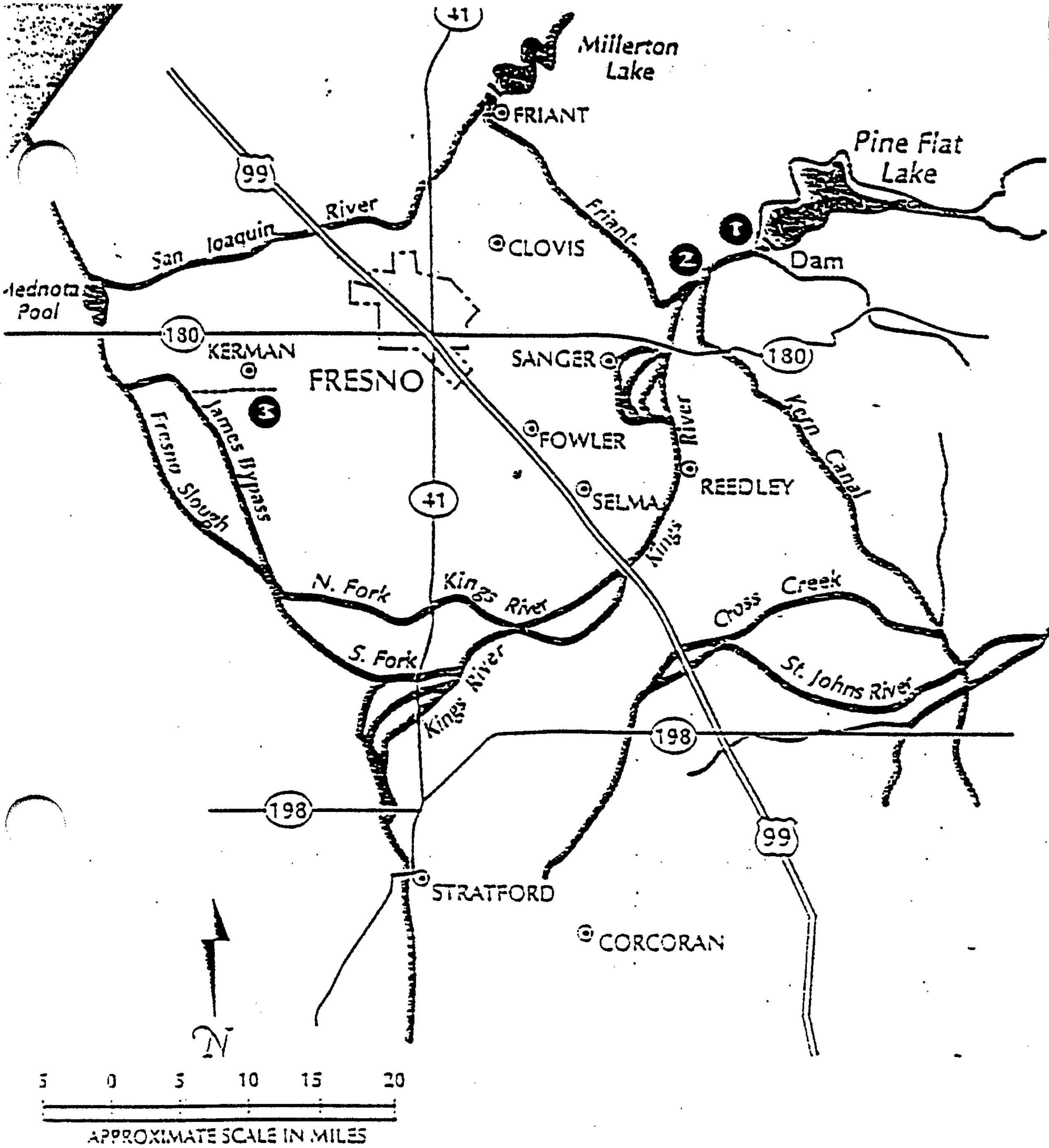
Friant-Kern Canal Habitat Restoration

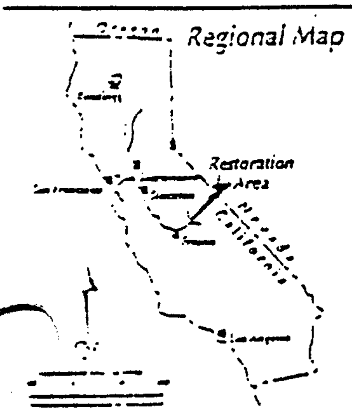
About 143.5 acres of Fresno County land immediately south of the Friant-Kern Canal siphon would be obtained or put under a long-term (50-year) conservation easement to reestablish riparian vegetation and wildlife habitat along the Kings River (Attachment 2). The restoration work would involve repairing perimeter fences, installing a revegetation sign at a fishing access parking area, excluding cattle from the restoration areas, planting restoration species, providing temporary irrigation to planted areas, and installing wildlife habitat enhancement structures. In order of priority, these structures could include brush piles, bluebird boxes, bat boxes, raptor perches, wood duck boxes, and/or songbird perches.

This alternative assumes repairing perimeter fences and installing a revegetation sign in Areas A and B; planting restoration species in Areas A and B; and installing temporary irrigation system in both Areas A and B.

Repairing perimeter fences would exclude cattle grazing from the site and would allow natural revegetation of the restoration site to a foothill woodland community similar to the surrounding area. The revegetation sign would inform the public and help protect natural areas from the public. Planting restoration species would help to preserve the riparian corridor along the Kings River.

Mixed riparian vegetation supports the densest and most diverse wildlife communities in the area. The diversity of plant species in this community provides a variety of foods and microhabitats for wildlife. Also, a wooded environment would help the Kings River temperature control for trout fisheries and provide refuge from predators for a variety of wildlife. The temporary irrigation system would promote quicker regeneration of native species





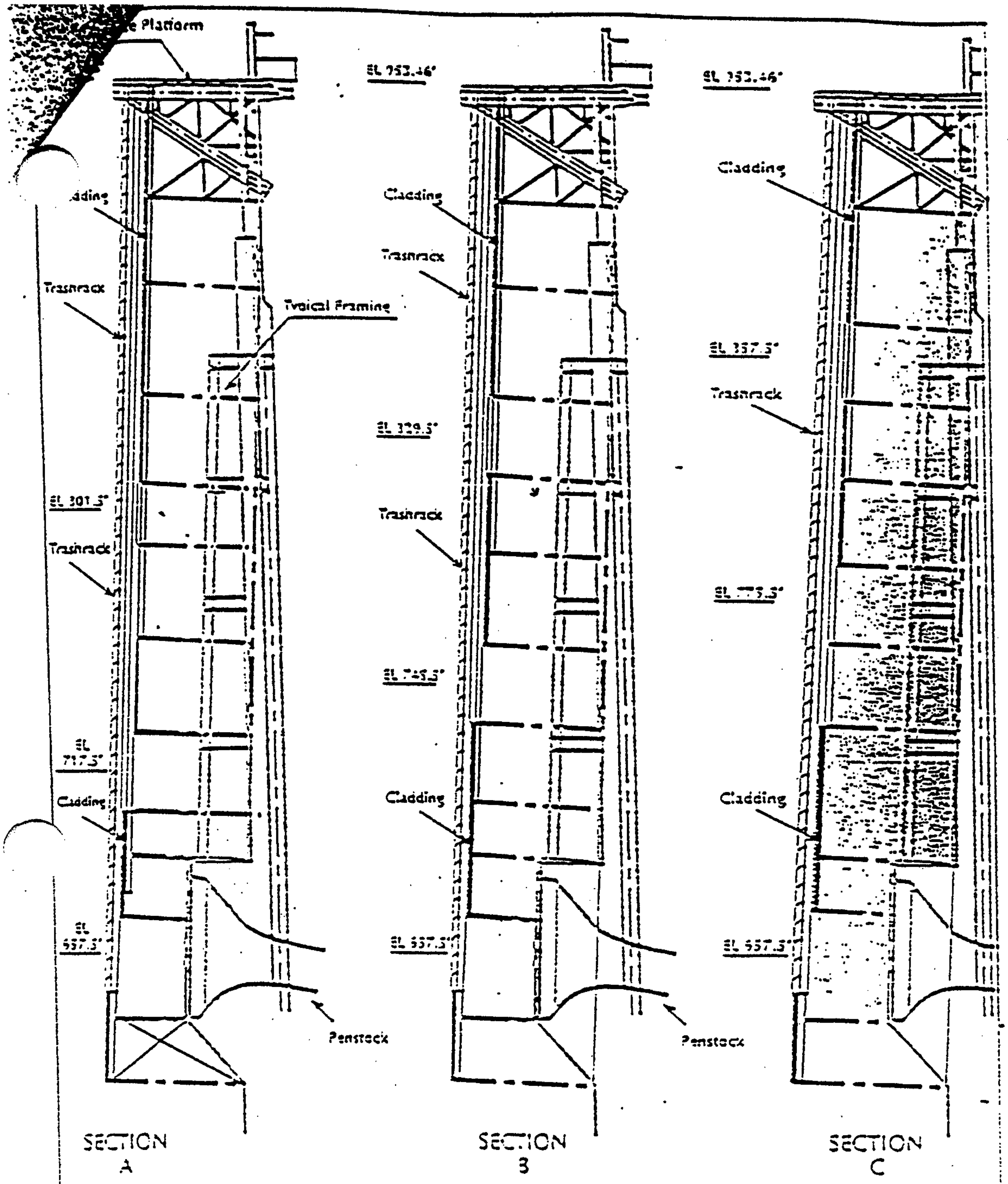
Legend

1. Multi-level Intake Structure
2. Friant-Kern Canal Restoration Site
3. Water Transfer Pipeline

PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

VICINITY MAP

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999



PINE FLAT DAM, CALIFORNIA
FISH AND WILDLIFE HABITAT RESTORATION

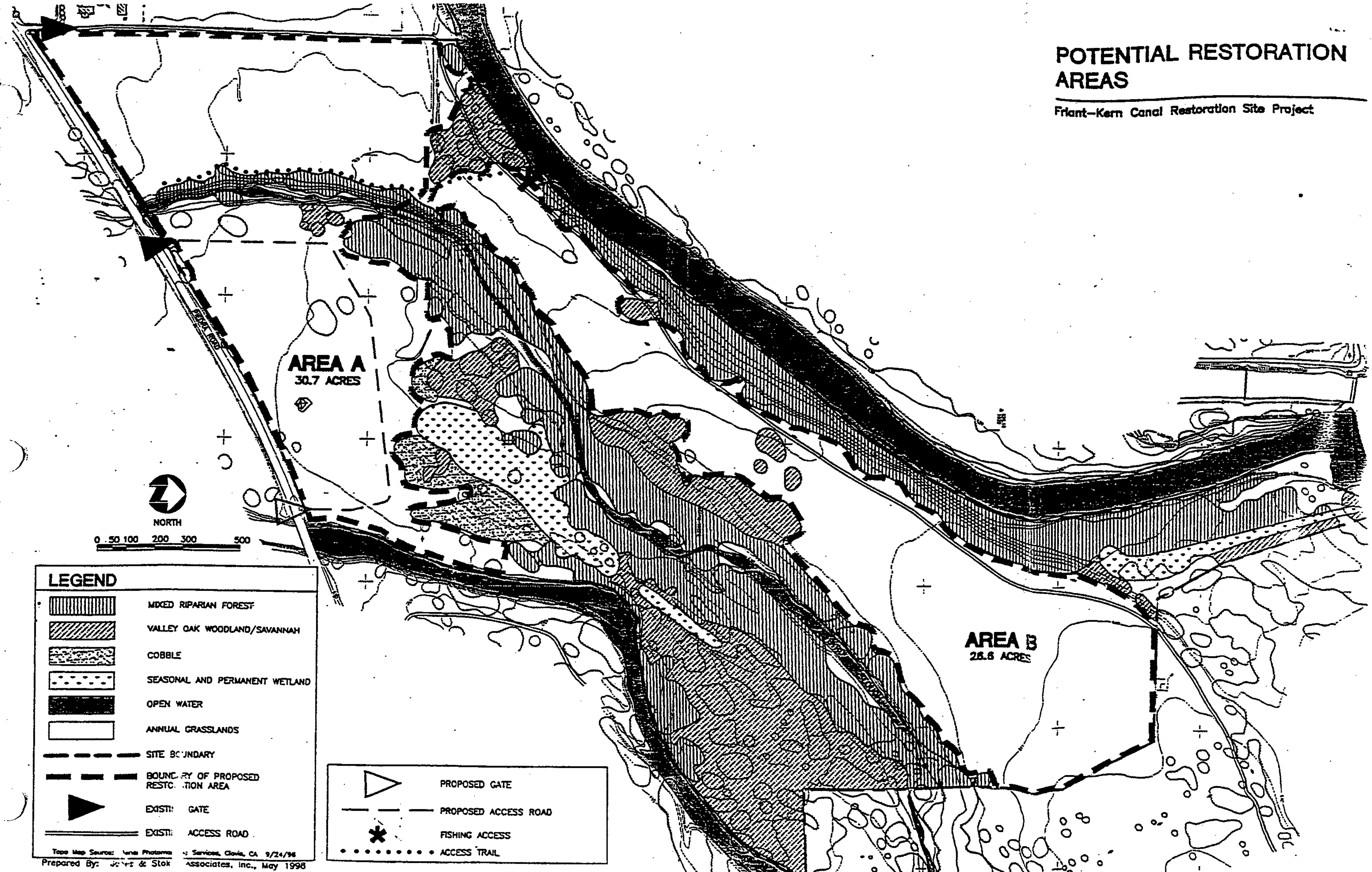
DRAFT

MULTILEVEL INTAKE STRUCTURE PROFILE

SACRAMENTO DISTRICT CORPS OF ENGINEERS
AUGUST 1999

POTENTIAL RESTORATION AREAS

Friant-Kern Canal Restoration Site Project



Plate

Biological Data Report for the Pine Flat Restoration Project

Prepared for:

U.S. Army Corps of Engineers
Sacramento District
Environmental Resources Branch
1325 J Street
Sacramento, CA 95814
Contact: Patricia Roberson
916/557-6705

Prepared by:

Jones & Stokes
2600 V Street, Suite 100
Sacramento, CA 95818-1914
Contact: Steven Avery
916/737-3000

April 2000

Table of Contents

Page

List of Tables and Figures

INTRODUCTION

The Sacramento District of the U.S. Army Corps of Engineers (Corps) is the federal sponsor of a restoration project planned along the upper portion of the Kings River in Fresno County, California. The restoration project, hereafter referred to as the Pine Flat restoration project, will benefit plant and wildlife species by restoring degraded habitat, increasing the amount of water in the upper portion of the Kings River, and increasing the ability to manipulate water temperatures during water releases from Pine Flat Dam. The Kings River Conservation District (KRCD) is the local sponsor of the project.

The restoration project consists of three measures:

- a multilevel intake structure at Pine Flat Dam,
- the Friant-Kern Canal restoration site, and
- a water transfer pipeline.

This document was prepared to assist the Corps in preparing an environmental impact statement (EIS) and components of the proposed environmental impact report (EIR) for the Pine Flat restoration project.

This document describes the background and project; the need for a biological data report; and components of the special-status plant, wildlife, and fish species evaluated for the project.

BACKGROUND AND PROJECT DESCRIPTION

Pine Flat Dam is located approximately 25 miles east of the City of Fresno. Completed by the Corps in 1954, the dam impounds the Kings River flows for flood control, irrigation, water conservation, recreation, and hydroelectric power generation. Downstream of Pine Flat Dam, the Corps constructed levees, channel improvements, and weirs to control floodflows. Channel modifications included vegetation clearing in the Centerville bottoms area, levee and channel improvements along Cole Slough, and levee and weir construction at the Kings River bifurcation.

In April 1994, the Corps completed a reconnaissance study investigating potential fish and wildlife habitat restoration measures in the Pine Flat area. Following public scoping, a wide variety of restoration measures were identified for further investigation. Through coordination involving the Corps and the KRCD, a systematic approach to further investigate these measures was developed. Of the restoration measures identified in the reconnaissance study, the KRCD

supported five projects. Two projects, the turbine bypass at Pine Flat Dam and the Avocado Lake restoration project, have been recommended for investigation under the Corps' Section 1135 program. Three of these measures, including a multilevel intake structure at Pine Flat Dam, the Friant-Kern Canal restoration site, and a water transfer pipeline, are analyzed in this document.

Multilevel Intake Structure

A multilevel intake structure would be located at Pine Flat Dam (Figure 1). The intake structures would be designed to fit over the existing penstocks at the dam. After the new intake structure is installed, water managers would be able to manipulate the temperature of water flowing into the Kings River by removing water from the reservoir at different depths.

The goal of this portion of the Pine Flat restoration project would be to remove water at higher depths in the reservoir during the early summer before water temperatures in the upper portion of the reservoir become warm. A greater volume of cool water in the lower portion of the reservoir could then be saved for release during late summer and fall. The cooler water released in late summer and fall would benefit cool water fish in the upper portion of the Kings River.

Friant-Kern Canal Restoration Site

The Friant-Kern Canal restoration site, which is also known as Fresno County's Kings River Green Belt Park) is situated within the Kings River basin in the eastern portion of the San Joaquin Valley (Figure 2). The Friant-Kern Canal restoration site comprises 120 acres between the Kings River to the northwest and the Alta Main Canal to the southeast (Figure 2). Byrd Slough, a relatively natural side channel of the Kings River, bisects the site from northeast to southwest. The site is owned by the Fresno County Parks Department (County) and was opened to the public in 1998.

The overall goal at the Friant-Kern Canal restoration site is to establish as much valley oak woodland and riparian forest as possible at the site. A secondary goal of the project is to preserve and enhance the site's existing wildlife habitats.

Water Transfer Pipeline

The water transfer pipeline is approximately 10.6 miles long and south of the city of Kerman (Figure 3). The pipeline would start at Dry Creek and proceed in a westerly direction to the Mendota pool located in the Mendota bypass (Figure 3). Currently, there are two proposed pipeline alternatives being considered. Alternative 1 includes two options at the west end of the alignment: Option 1A and Option 1B (Figure 4). Alternative 2 occurs approximately 0.4 mile north of Alternative 1 and runs parallel to it (Figure 4). Both pipeline alternatives are primarily along farm roads in an agricultural setting. Alfalfa plantings, orchards, and grape vineyards are located along most of the route.

The goal of the water transfer pipeline is to allow greater instream flow in the upper portion of the Kings River during late summer and fall and to provide a means to meet water delivery needs in the San Joaquin Valley. Central Valley Project (CVP) water and Pine Flat Reservoir water would be exchanged as a part of this project.

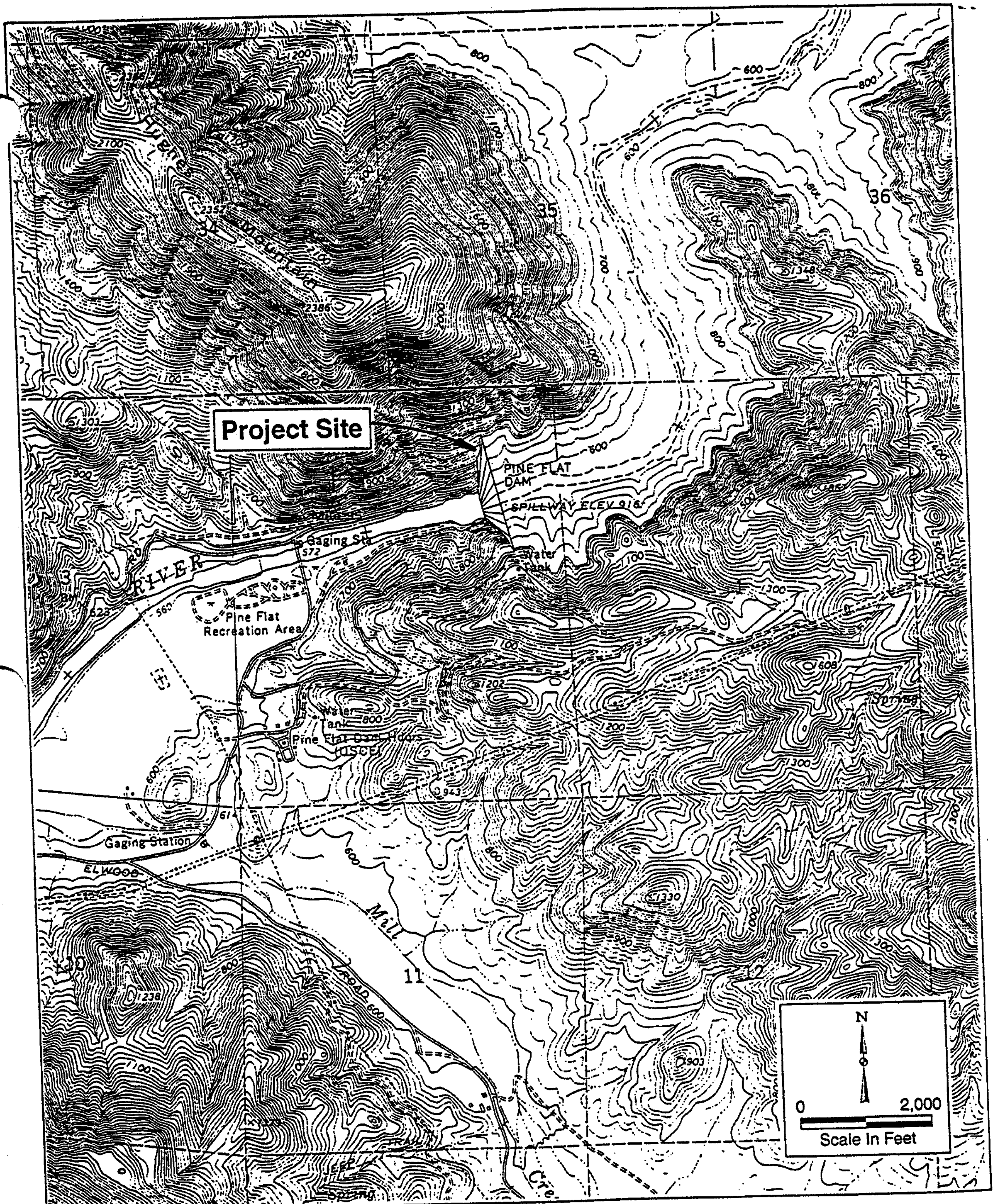
NEED FOR BIOLOGICAL DATA REPORT

This biological data report (BDR) evaluates effects of the proposed project on listed and proposed species with potential to occur in the three project areas. A species list was provided by U.S. Fish and Wildlife Service (USFWS) on August 4, 1997 (Appendix A). The BDR has been prepared in compliance with Section 7 of the U.S. Endangered Species Act of 1973 (ESA) (16 U.S.C. 1536).

The BDR provides information regarding listed and proposed species, including legal status, species description, habitat requirements, distribution, possible reasons for endangerment, occurrence in the project area, analysis of the project impacts on the species or designated critical habitat, and preliminary mitigation measures.

SENSITIVE COMMUNITIES AND SPECIES SELECTED FOR EVALUATION

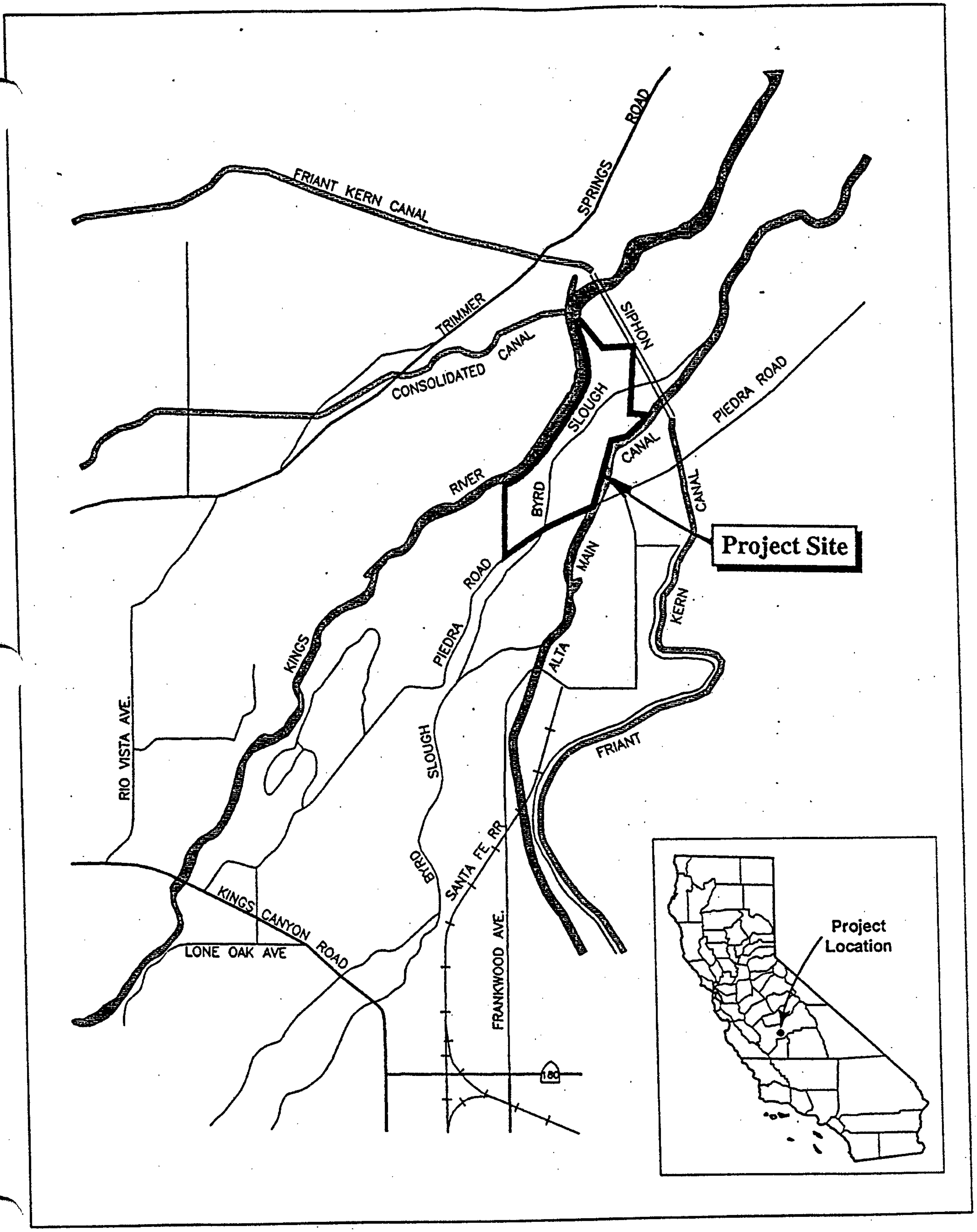
This BDR evaluates in detail two sensitive communities, 15 plant species, 11 wildlife species, and three fish species. The selection of these species is based on historical and recent documentation of the species in the project area, the presence or suspected presence of potentially suitable habitat in the project area, and professional experience. The presence of potentially suitable habitat for the following species was determined during reconnaissance-level surveys conducted by a Jones & Stokes botanist and wildlife biologist on September 11 and 12, 1997.



Base map: USGS Pine Flat Dam, California 7.5-minute quadrangle 1965 (PR 1978).

Jones & Stokes

Figure 1
Multilevel Intake Structure at Pine Flat Dam



Jones & Stokes

Figure 2
Friant-Kern Canal Restoration Site, Freson County

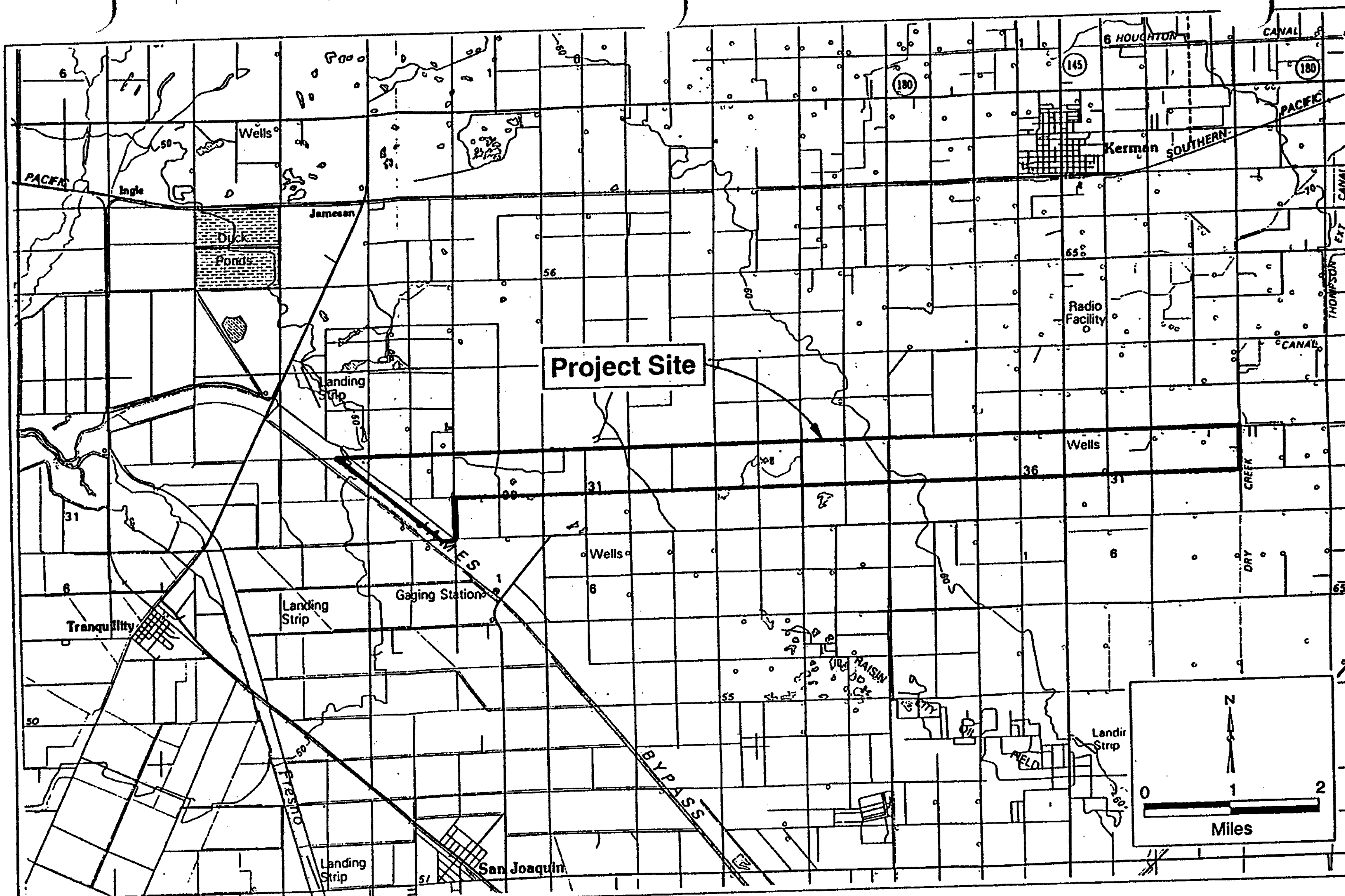
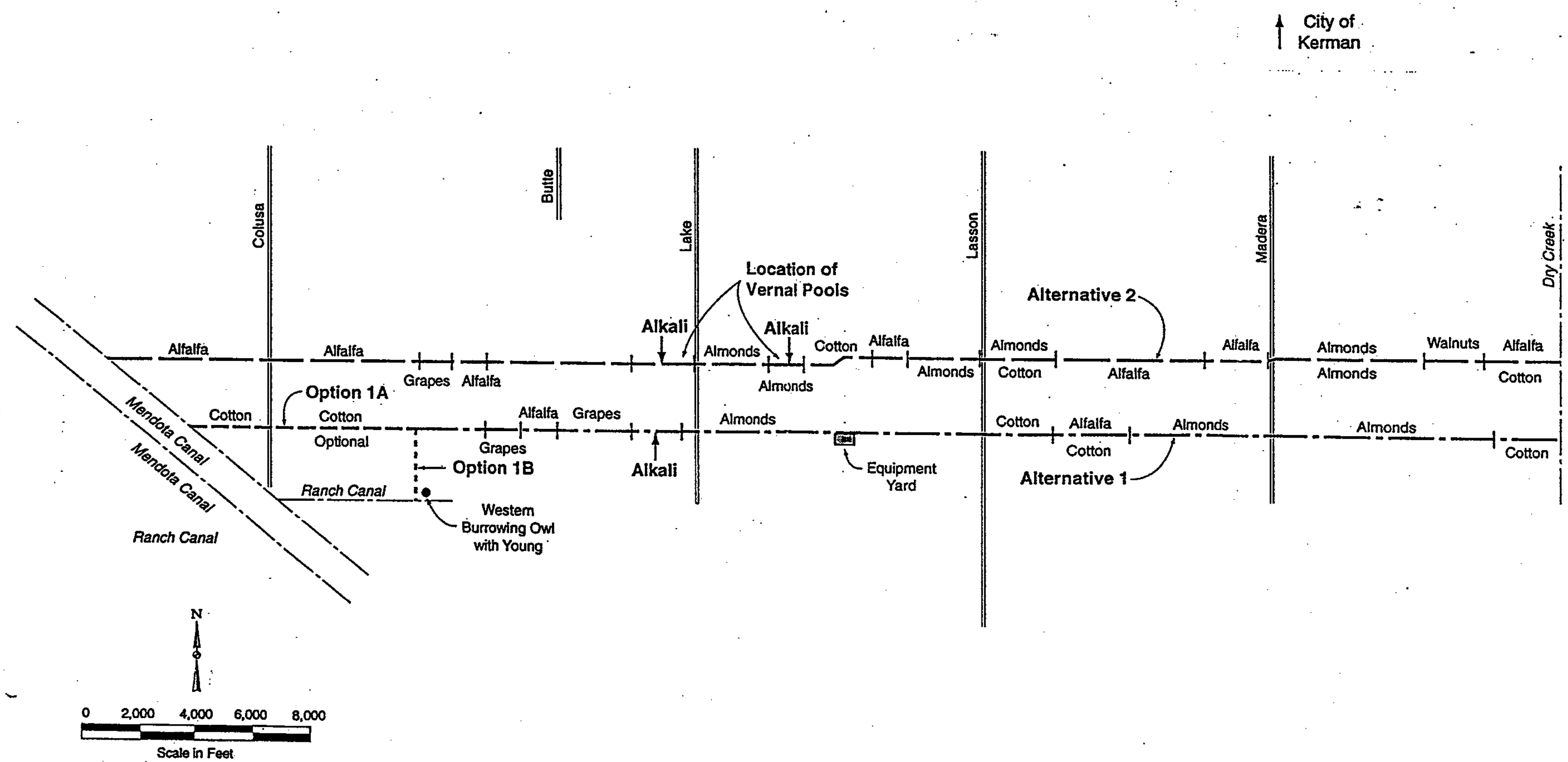


Figure 3
Water Transfer Pipeline Project Site

Jones & Stokes

Figure 4
Water Transfer Pipeline Routes (Alternatives 1 and 2) and Location of Sensitive Habitats and Special-Status Wildlife



Jones & Stokes Associates, Inc.

The species discussed below are grouped according to occurrence at one of the three sites, with the water transfer pipeline site discussed first, followed by the Friant-Kern Canal restoration site, and the multilevel intake structure. No botanical plant accounts were prepared for the third component of the project, the multilevel intake structure at Pine Flat Dam, because this component is not expected to have any impact on these resources. Species accounts for bald eagles and fish, however, were prepared for the multilevel intake structure project.

The approximate locations of alkali habitat along the water transfer pipeline project area that supports chenopod scrub and alkali scalds are indicated in Figure 4. This figure does not represent the exact extent of the habitat types, nor is it necessarily inclusive. It is based on preliminary mapping done in the field on a general overview map of the area.

Sensitive Natural Communities

Sensitive natural communities are especially diverse; regionally uncommon; or of special concern to local, state, and federal agencies. Elimination or substantial degradation of these communities would constitute a significant impact under the California Environmental Quality Act (CEQA). Riparian habitat present at the Friant-Kern Canal restoration site would qualify as a sensitive natural community and may also be subject to Section 404 of the Clean Water Act. The alkali shrub and scald areas found along both pipeline route alternatives would likely be characterized as valley sink scrub or valley saltbush scrub, which are both considered sensitive natural communities. Although historically they were widely spread throughout the San Joaquin Valley, they have sustained substantial losses because of agricultural conversion, flood control, and groundwater pumping. Scald areas within these communities may also qualify as wetlands of other waters of the United States subject to Section 404 of the Clean Water Act. Impacts on all sensitive natural communities within the project area should be avoided wherever possible, regardless of whether they harbor special-status plant or wildlife species.

Special-Status Plants

Plant species evaluated in detail for the water transfer pipeline site include the San Joaquin woolly threads (*Lembertia congdonii*), heartscale (*Atriplex cordulata*), Lost Hills crownscale (*Atriplex vallicola*), brittlescale (*Atriplex depressa*), lesser saltbush (*Atriplex minuscula*), Hoover's eriastrum (*Eriastrum hooveri*), recurved larkspur *(Delphinium recurvatum*), and palmate bird's-beak *(Cordylanthus palmatus*). Information on these species is included in Table 1.

Plant species evaluated in detail for the Friant-Kern Canal restoration site include California jewelflower (*Caulanthus californicus*), forked fiddleneck (*Amsinkia vernicosa* var. *furcata*), pale-yellow layia (*Layia heterotricha*), tree-anemone (*Carpenteria californica*), San Joaquin adobe sunburst (*Pseudobahia peirsonii*), obovate-leaved thornmint (*Acanthomintha obovata* ssp. *obovata*), and South Coast Range morning-glory (*Calystegia collina* ssp. *venusta*). Information on these species is also included in Table 1.

Several species were only discussed in Table 1 and not elsewhere in the BDR because, based on the available habitat, they have a very low potential to occur at the water transfer pipeline site. These species include Hartweg's golden sunburst (*Pseudobahia bahiifolia*), Keck's checkerbloom (*Sidalcea keckii*), Mariposa pussypaws (*Calyptridium pulchellum*), orange lupine (*Lupinus citrinus* var. *citrinus*), San Benito evening-primrose (*Camissonia benitensis*), San Benito spineflower (*Chorizanthe biloba* var. *immemora*), and mouse buckwheat (*Eriogonum nudum* var. *murinum*). While it is unlikely that any of the above species occur at the site, a qualified botanist should be retained before construction to survey for these species at the time of year when the plants would be identifiable. If any populations are found onsite, adverse effectsono these populations should be avoided. This can be accomplished by avoiding the populations during project implementation, or by developing and implementing a mitigation plan in cooperation with California Department of Fish and Game (DFG) and USFWS.

Several species that occur on the USFWS list and are included in Table 1 were not evaluated because they do not occur within the geographic area of the project or because no suitable habitat was present within the project area to support the species. These species include fleshy owl's clover (*Castilleja campestris* ssp. *succulenta*), San Joaquin Valley orcutt grass (*Orcuttia inaequalis*), Greene's tuctoria (*Tuctoria greenei*), Bodie Hills rockcress (*Arabis bodiensis*), Raven's milk-vetch (*Astragalus monoensis* var. *ravenii*), Mono Hot Springs evening primrose (*Camissonia sierrae* ssp. *alticola*), Fresno County bird's beak (*Cordylanthus tenuis* ssp. *barbatus*), spiny-sepaled coyote thistle (*Eryngium spinosepalum*), Hollisteria (*Hollisteria lanata*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), Panoche peppergrass (*Lepidium jaredii* var. *album*), long-petaled Lewisia (*Lewisia longipetala*), valley sagittaria (*Sagittaria sanfordii*), Rayless layia (*Layia discoidea*), and parasol clover (*Trifolium bolanderi*).

San Joaquin woolly threads (*Lembertia congdonii*)

Family: Asteraceae

Legal Status: San Joaquin woolly threads are federally listed as endangered. The California Native Plant Society (CNPS) categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Habitat for San Joaquin woolly threads is restricted to alkaline and loamy plains

in chenopod scrub, sandy valley, and foothill grassland. The elevation ranges from 300 to 2,300 feet above sea level. Little of this habitat remains in the San Joaquin Valley south of Mendota because most of the habitat has been converted to irrigated agriculture (Natural Diversity Data Base 1997a). The flowering period is from March to May (Skinner and Pavlik 1994).

Distribution. San Joaquin woolly threads is known from approximately 30 occurrences, primarily in the southwestern San Joaquin Valley. Currently, it occurs in Fresno, Kern, Santa Barbara, San Benito, and San Luis Obisbo Counties. Historically, it also occurred in Kings and Tulare Counties but is now presumed extirpated from these areas (Skinner and Pavlik 1994).

Endangerment. The greatest threats to San Joaquin woolly threads is loss of habitat because of agricultural conversion, energy development, urbanization, and other human related activities (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether there are any occurrences of San Joaquin woolly threads within the proposed water transfer pipeline corridors. The route does support several areas of alkali sink scrub that could provide suitable habitat for San Joaquin woolly threads. This species is known from one historic occurrence within the project region. It was observed 6 miles south of Mendota in the Mendota Plain (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on San Joaquin woolly threads.

Mitigation. A survey for San Joaquin woolly threads should be conducted in all areas of the proposed corridor that support suitable habitat for this species. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of San Joaquin woolly threads are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Heartscale (*Atriplex cordulata*)

Family: Chenopodiaceae

Legal Status: Heartscale is federally listed as a species of concern. The CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Heartscale is typically found in alkali grasslands on saline and alkaline soils in and around scald areas. It is found in chenopod scrub and valley and foothill grassland habitats. Jones & Stokes Associates' file data indicate that heartscale is commonly associated with low barley (*Hordeum depressum*), Mediterranean barley (*Hordeum marinum* ssp. *gussoneanium*), crownscale, brittlescale, lesser saltbush, and bush seepweed (*Suaeda moquinii*). The flowering period for heartscale is from April to June.

Distribution. Currently, heartscale is found in Alameda, Butte, Fresno, Glenn, Kings, Kern, Madera, Merced, Solano, and Tulare Counties (Skinner and Pavlik 1994) below an elevation of 660 feet (200 meters [m]) (Hickman 1993). Historically, it also occurred in Contra Costa, San Joaquin, and Stanislaus Counties but is now presumed extirpated from these areas (Skinner and Pavlik 1994). One of the species' core distribution areas is in Merced and Fresno Counties. Another core distribution area occurs on the Sacramento National Wildlife Refuge in Glenn County and nearby Gray Lodge State Wildlife Area in Butte County.

Endangerment. The greatest threats to heartscale are loss of habitat because of agriculture and other human-related activities (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether there are any occurrences of heartscale within the proposed water transfer pipeline corridors. The route does support several areas of chenopod scrub including alkali scalds that could provide suitable habitat for heartscale. Heartscale is known from two recent occurrences in the project region, at the Alkali Sink Ecological Reserve near Tranquillity Junction and at the Kerman Ecological Reserve both Fresno County. It was also known to occur on a site 6 miles south of Kerman (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on heartscale.

Mitigation. A survey for heartscale should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of heartscale are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Lost Hills crownscale (*Atriplex vallicola*)

Family: Chenopodiaceae

Legal Status: Lost Hills crownscale is federally listed as a species of concern. The CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Lost Hills crownscale is typically found in dried ponds and alkaline soils in vernal pools, chenopod scrub, and valley and foothill grassland habitats. It grows in association with Frankenia (*Frankenia* sp.), saltbush (*Atriplex* spp.), and saltgrass (*Distichlis* sp.) (Natural Diversity Data Base 1997a). The flowering period for Lost Hills crownscale is from May to August (Skinner and Pavlik 1994).

Distribution. Currently, Lost Hills crownscale is found in Fresno, Kings, Kern, Merced, and San Luis Obisbo Counties (Skinner and Pavlik 1994) below an elevation of 660 feet (200 m) (Hickman 1993).

Endangerment. The greatest threats to Lost Hills crownscale are grazing and habitat loss because of agricultural conversion (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether there are any occurrences of Lost Hills crownscale within the proposed water transfer pipeline corridors. The route does support several areas of chenopod scrub, including alkali scalds that could provide suitable habitat for Lost Hills crownscale. Lost Hills crownscale is known from one recent occurrence in the project region, at the Kerman Ecological Reserve. It was also known to occur on a site in Mendota (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on Lost Hills crownscale.

Mitigation. A survey for Lost Hills crownscale should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of Lost Hills crownscale are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Brittlescale (*Atriplex depressa*)

Family: Chenopodiaceae

Legal Status: The CNPS categorizes brittlescale as 1B, rare or endangered in California

and elsewhere (Skinner and Pavlik 1994).

Habitat. Brittlescale is typically found in alkaline and clay soils in chenopod scrub, playas, and valley and foothill grassland habitats, and rarely found in vernal pools. It grows in association with Nitrophila (*Nitrophila occidentalis*), heartscale, and lesser saltbush (Natural Diversity Data Base 1997a). The flowering period for Lost Hills crownscale is from May to October (Skinner and Pavlik 1994).

Distribution. Currently, brittlescale is found in Alameda, Contra Costa, Colusa, Fresno, Glenn, Kern, Madera, Merced, Solano, Tulare, and Yolo Counties (Skinner and Pavlik 1994) below an elevation of 660 feet (200 m) (Hickman 1993). It also occurred in Stanislaus County but is now presumed extirpated from that area (Skinner and Pavlik 1994).

Endangerment. The greatest threats to brittlescale are habitat loss and disturbance because of agricultural and other human-related activities (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether there are any occurrences of brittlescale within the proposed water transfer pipeline corridors. The route does support several areas of chenopod scrub, including alkali scalds that could provide suitable habitat for brittlescale. Brittlescale is known from seven recent occurrences in the project region, all at the Alkali Sink and Kerman Ecological Reserves. It was also known to occur at two additional sites along Highway 180, one that was 2 miles south of Kerman and another that was 2.5 miles east of Tranquillity Junction (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on brittlescale.

Mitigation. A survey for brittlescale should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of brittlescale are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Lesser saltbush (*Atriplex minuscula*)

Family: Chenopodiaceae

Legal Status: The CNPS categorizes lesser saltbrush as 1B, rare or endangered in

California and elsewhere (Skinner and Pavlik 1994).

Habitat. Lesser saltbush is typically found in sandy and alkaline soils in chenopod scrub, playas, and valley and foothill grassland habitats. It grows in association with Nitrophila (*Nitrophila occidentalis*), brittlescale, bush seepweed, and alkali weed (*Cressa truxilensis*) (Natural Diversity Data Base 1997a). The flowering period for lesser saltbush is from May to October (Skinner and Pavlik 1994).

Distribution. Currently, lesser saltbush is known from Fresno, Kern, and Madera Counties (CNPS 1997a, Skinner and Pavlik 1994) below an elevation of 660 feet (200 m) (Hickman 1993). Historically, it also occurred in Merced and Tulare Counties but is now presumed extirpated from those areas (Skinner and Pavlik 1994).

Endangerment. The greatest threats to lesser saltbush are habitat loss and disturbance because of agricultural and other human-related activities (Skinner and Pavlik 1994).

Project Area Occurrence. During a reconnaissance-level survey of the proposed water transfer pipeline routes, a specimen of lesser saltbush was collected at one of the chenopod scrub areas occurring within the corridor. Lesser saltbush is known from three recent occurrences in the project region, all at the Kerman Ecological Reserve. It was also known to occur at one additional site 8 miles west of Kerman (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on lesser saltbush. The current route avoids the population that was detected during the reconnaissance-level survey. However, other populations of lesser saltbush could occur in chenopod scrub areas crossed by the proposed water transfer pipeline routes.

Mitigation. A survey for lesser saltbush should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of lesser saltbush are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Hoover's eriastrum (*Eriastrum hooveri*)

Family: Verbenaceae

Legal Status: Hoover's eriastrum is federally listed as threatened. The CNPS categorizes the plant as 4, plants of limited distribution (Skinner and Pavlik 1994).

Habitat. Hoover's eriastrum is typically found on mound tops on sandy soils in sparsely vegetated alkaline alluvium fans below 500 feet and above 2,000 feet in the Temblor Range. It occurs in chenopod scrub and valley and foothill grassland habitat types. It grows in association with iodine bush (*Allenrolfea occidentalis*) and bush seepweed (Natural Diversity Data Base 1997a). The flowering period for Hoover's eriastrum is from April to July (Skinner and Pavlik 1994).

Distribution. Currently, Hoover's eriastrum is known from Fresno, Kings, Kern, Santa Barbara, San Benito, San Luis Obisbo, and Tulare Counties (Skinner and Pavlik 1994).

Endangerment. The greatest threats to Hoover's eriastrum is loss of habitat because of agriculture, energy development, urbanization, and other human-related activities (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether there are any occurrences of Hoover's eriastrum within the proposed water transfer pipeline corridors. The route does support several areas of chenopod scrub that could provide suitable habitat for Hoover's eriastrum. Hoover's eriastrum is known from six recent occurrences in the project region, near the town of Whites Bridge, at the Alkali Sink Ecological Reserve, and south of the Kerman railroad station (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on Hoover's eriastrum.

Mitigation. A survey for Hoover's eriastrum should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of Hoover's eriastrum are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Recurved larkspur *(Delphinium recurvatum)*

Family: Ranunculaceae

Legal Status: Recurved larkspur is federally listed as a species of concern. The CNPS

categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Recurved larkspur is typically found on poorly drained, fine, alkaline soils in chenopod scrub, valley and foothill grassland, cismontane woodland and vernal pool habitats. It is commonly associated with saltbush (Hickman 1993, Natural Diversity Data Base 1997a). The flowering period for recurved larkspur is from March to May (Skinner and Pavlik 1994).

Distribution. Recurved larkspur is found in and around the San Joaquin and Sacramento Valleys in Alameda, Contra Costa, Colusa, Fresno, Kings, Kern, Merced, San Luis Obispo, Solano, and Tulare Counties (Skinner and Pavlik 1994) at elevations from 10 to 2,000 feet (Natural Diversity Data Base 1997a).

Endangerment. The greatest threats to recurved larkspur are grazing and habitat loss because of agriculture (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether recurved larkspur occurs within the proposed water transfer pipeline corridors. The route does support several areas of chenopod scrub, including alkali scalds that could provide suitable habitat for recurved larkspur. Recurved larkspur is known from one recent occurrence in the project region, along Highway 180, 7 miles to the west of Kerman (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on recurved larkspur.

Mitigation. A survey for recurved larkspur should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of recurved larkspur are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Palmate bird's-beak *(Cordylanthus palmatus)*

Family: Scrophulariaceae

Legal Status: Palmate bird's-beak is federally and state listed as endangered. The CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Palmate bird's-beak is typically found on alkaline flats in chenopod scrub and valley and foothill grassland (Hickman 1993). It grows in association with iodine bush (*Allenrolfea occidentalis*), saltgrass (*Distichlis* sp.), and pickleweed (*Salicornia* sp.) (Natural Diversity Data Base 1997a). The flowering period for palmate bird's-beak is from May to October (Skinner and Pavlik 1994).

Distribution. Palmate bird's-beak is currently known from approximately six occurrences in Alameda, Colusa, Fresno, and Yolo Counties (Skinner and Pavlik 1994) below an elevation of 200 feet (Hickman 1993). It also occurred in Madera and San Joaquin Counties but is now presumed extirpated from these areas (Skinner and Pavlik 1994).

Endangerment. The greatest threats to palmate bird's-beak are altered hydrology and habitat loss because of agriculture, urbanization, vehicles, and other human-related activities (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown, whether palmate bird's-beak occurs in the immediate vicinity of the proposed water transfer pipeline routes. The route does support several areas of chenopod scrub, including alkali scalds that could provide suitable habitat for palmate bird's-beak. Palmate bird's-beak is known from four recent occurrences in the project region, in the Mendota Wildlife Management Area and in the Alkali Sink Ecological Reserve. It is historically known, but presumed extirpated from two additional sites, one that is 7 miles east-southeast of Medota along Highway 180 and another that is 6 miles south of Kerman (Natural Diversity Data Base 1997a).

Project Impacts. Because suitable habitat for this species occurs along both proposed water transfer pipeline routes, the proposed project could potentially have an impact on palmate bird's-beak.

Mitigation. A survey for palmate bird's-beak should be conducted in all areas of the proposed corridor that support suitable habitat. The survey should be conducted by a qualified botanist at the time of year when the plants would be identifiable. If any populations of palmate bird's-beak are found during the survey, the proposed project should be designed to avoid any adverse effects on these populations. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan n cooperation with DFG and USFWS.

California jewelflower (*Caulanthus californicus*)

Family: Brassicaceae

Legal Status: California jewelflower is federally and state listed as endangered. The

CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. California jewelflower is typically found at an elevation between 210 and 3,300 feet on flats and gentle slopes in non-alkaline grassland, in chenopod scrub, open pinyon-juniper woodland, and valley and foothill grassland (Hickman 1993). The flowering period for California jewelflower is from February to May (Skinner and Pavlik 1994).

Distribution. California jewelflower is currently known from approximately 20 occurences in Fresno, Kern, Santa Barbara, and San Luis Obisbo Counties (Skinner and Pavlik 1994). It was also known from 35 historical occurrences in Kings and Tulare Counties but is now presumed extirpated from the in those areas (Skinner and Pavlik 1994).

Endangerment. The greatest threats to California jewelflower are habitat loss and damage because of agriculture, urbanization, energy development, grazing, and other human-related activities (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether any populations of California jewelflower occur within the Friant-Kern Canal restoration site. No occurences of California jewelflower are known from the Wahtoke, Piedra, and Pine Flat Dam quadrangles (Natural Diversity Data Base 1997a).

Project Impacts. No impacts on California jewelflower are expected in the project area because no ground disturbing activites are currently planned at the Friant-Kern Canal restoration site. However, suitable grassland habitat is present at the project site.

Mitigation. If any ground disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for California jewelflower at the appropriate time of year when the plants would be identifiable. If any populations of California jewelflower are found on-site, adverse effects to these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Forked fiddleneck (*Amsinkia vernicosa* var. *furcata*)

Family: Boraginaceae

Legal Status: Forked fiddleneck is federally listed as a species of concern. The CNPS categorizes the plant as 4, plants of limited distribution (Skinner and Pavlik 1994).

Habitat. Forked fiddleneck is typically found at an elevation between 150 and 3,300 feet

on loose, shale slopes in woodland and valley and foothill grassland habitats (Hickman 1993). The flowering period for forked fiddleneck is from March to May (Skinner and Pavlik 1994).

Distribution. Since 1991, forked fiddleneck has been known from several unthreatened populations, many more than previously thought. It is currently known to occur in Fresno, Kings, Kern, San Benito, and San Luis Obisbo Counties (Skinner and Pavlik 1994).

Endangerment. The threats to forked fiddleneck are from habitat loss or damage because of mining and grazing (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether any populations of forked fiddleneck occur within the Friant-Kern Canal restoration site. No occurences of forked fiddleneck are known from the Wahtoke, Piedra, and Pine Flat Dam quadrangles.

Project Impacts. No impacts on forked fiddleneck are expected in the project area because no ground disturbing activites are currently planned at the Friant-Kern Canal restoration site. However, suitable grassland habitat is present at the project site.

Mitigation. If any ground disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for forked fiddleneck at the appropriate time of year when the plants would be identifiable. If any populations of forked fiddleneck are found on-site, adverse effects on these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Pale-yellow layia (*Layia heterotricha*)

Family: Asteraceae

Legal Status: Pale-yellow layia is federally listed as a species of concern. The CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Pale-yellow layia is found below an elevation of 5,300 feet on alkaline or clay soils in open areas of oak woodlands, pinyon-juniper woodlands, and valley and foothill grasslands (Hickman 1993, Skinner and Pavlik 1994). The flowering period for pale-yellow layia is from March to June (Skinner and Pavlik 1994).

Distribution. Pale-yellow layia is currently known from Santa Barbara County (Skinner and Pavlik 1994). Historically, it also occurred in Fresno, Kings, Kern, Monterey, San Luis Obisbo, and possibly San Benito and Ventura Counties, but is now presumed extirpated from

these areas (Skinner and Pavlik 1994).

Endangerment. The greatest threats to pale-yellow layia are habitat loss and damage because of agriculture, construction of San Antonio Reservoir, and possibly overgrazing (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether any populations of pale-yellow layia occur within the Friant-Kern Canal restoration site. No occurrences of pale-yellow layia are known from the Wahtoke, Piedra, and Pine Flat Dam quadrangles.

Project Impacts. No impacts on pale-yellow layia are expected in the project area. However, suitable grassland habitat is present at the project site.

Mitigation. If any ground disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for pale-yellow layia at the appropriate time of year when the plants would be identifiable. If any populations of pale-yellow layia are found on-site, adverse effects on these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Tree-anemone (*Carpenteria californica*)

Family: Philadelphaceae

Legal Status: Tree-anemone is proposed threatened under the federal ESA and state listed as threatened. The CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. Tree-anemone is found at an elevation between 1,500 and 3,300 feet on streambanks and granite substrates in chaparral and oak woodland habitats (Skinner and Pavlik 1994). The flowering period for tree-anemone layia is from May to July (Skinner and Pavlik 1994).

Distribution. Tree-anemone is known from fewer than 10 occurrences in Fresno County between the San Joaquin and Kings Rivers. Historical reports indicate its occurrence in Madera County from introduced plants (Skinner and Pavlik 1994).

Endangerment. The greatest threats to tree-anemone are habitat loss and damage because of road construction, vehicles, logging, development, and fire suppression (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether any populations of tree-anemone occur within the Friant-Kern Canal restoration site. No occurrences of tree-anemone are known from the Wahtoke, Piedra, and Pine Flat Dam quadrangles.

Project Impacts. No impacts on tree-anemone are expected in the project area. However, suitable oak woodland habitat is present at the project site.

Mitigation. If any ground-disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for tree-anemone at the appropriate time of year when the plants would be identifiable. If any populations of tree-anemone are found on-site, disturbance to these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

San Joaquin adobe sunburst (*Pseudobahia peirsonii*)

Family: Asteraceae

Legal Status: San Joaquin adobe sunburst is federally listed as threatened and state listed as endangered. The CNPS categorizes the plant as 1B, rare or endangered in California and elsewhere (Skinner and Pavlik 1994).

Habitat. San Joaquin adobe sunburst is found at an elevation between 330 and 2,600 feet on bare, dark clay soils in valley and foothill grassland and oak woodland habitats (Hickman 1993, Skinner and Pavlik 1994). The flowering period for San Joaquin adobe sunburst is from March to April (Skinner and Pavlik 1994).

Distribution. San Joaquin adobe sunburst is known from fewer than 20 occurrences in Fresno, Kern, and Tulare Counties (Skinner and Pavlik 1994).

Endangerment. San Joaquin adobe sunburst is seriously threatened from habitat loss or damage because of agriculture, herbicide spraying, mowing, discing, grazing, development, road construction, and flood control activities (Skinner and Pavlik 1994, Natural Diversity Data Base 1997b).

Project Area Occurrence. It is unknown whether any populations of San Joaquin adobe sunburst occur within the Friant-Kern Canal restoration site. San Joaquin adobe sunburst is known from one recent occurrence in the project region. It was observed along Highway 180 between the Friant-Kern and Alta-Main Canals (Natural Diversity Data Base 1997b).

Project Impacts. No impacts on San Joaquin adobe sunburst are expected in the project

area. However, suitable grassland and oak woodland habitat is present at the project site.

Mitigation. If any ground-disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for San Joaquin adobe sunburst at the appropriate time of year when the plants would be identifiable. If any populations of San Joaquin adobe sunburst are found on-site, disturbance to these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Obovate-leaved thornmint (*Acanthomintha obovata* ssp. *obovata*)

Family: Lamiaceae

Legal Status: Obovate-leaved thornmint is federally listed as a species of concern. The CNPS categorizes the plant as 4, plants of limited distribution (Skinner and Pavlik 1994).

Habitat. Obovate-leaved thornmint is typically found on heavy clay, alkaline, and serpentinite substrates in grassy slopes, oak woodland, and chaparral habitat below an elevation of 5,000 feet (Hickman 1993; Skinner and Pavlik 1994). The flowering period is from April to June (Skinner and Pavlik 1994).

Distribution. Obovate-leaved thornmint is currently known from Fresno, Monterey, San Benito, and San Luis Obispo Counties (Skinner and Pavlik 1994).

Endangerment. Currently, the greatest threat to obovate-leaved thornmint is grazing (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown whether any populations of obovate-leaved thornmint occur within the Friant-Kern Canal restoration site. Obovate-leaved thornmint is not known to occur within the project region (Natural Diversity Data Base 1997b).

Project Impacts. No impacts on obovate-leaved thornmint are expected in the project area. However, suitable oak woodland habitat is present at the project site.

Mitigation. If any ground-disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for obovate-leaved thornmint at the appropriate time of year when the plants would be identifiable. If any populations of obovate-leaved thornmint are found on-site, adverse effects on these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

South Coast Range morning-glory (*Calystegia collina* ssp. *venusta*)

Family: Convolvulaceae

Legal Status: Federal - species of concern; state - none. The CNPS categorizes the plant as 4, plants of limited distribution (Skinner and Pavlik 1994).

Habitat. South Coast Range morning-glory is typically found below an elevation of 2,000 feet on sedimentary or serpentinite substrates in valley and foothill grassland, chaparral, and open oak-pine woods habitats (Hickman 1993). The flowering period for South Coast Range morning-glory is generally from May to June (Skinner and Pavlik 1994).

Distribution. Many new occurrences of South Coast Range morning-glory were discovered in 1991 and 1992. South Coast Range morning-glory is currently known to occur in Fresno, Monterey, Santa Barbara, and San Benito Counties (Skinner and Pavlik 1994).

Endangerment. South Coast Range morning-glory is considered tolerant of disturbances (Skinner and Pavlik 1994).

Project Area Occurrence. It is unknown, whether south coast range morning-glory occurs within the Friant-Kern Canal restoration site. South coast range morning-glory is not known to occur within the project region (Natural Diversity Data Base 1997b).

Project Impacts. No impacts on south coast range morning-glory are expected in the project area. However, suitable grassland habitat is present at the project site.

Mitigation. If any ground disturbing activities are planned at the restoration site, a qualified botanist should be retained to survey for South Coast Range morning-glory at the appropriate time of year when the plants would be identifiable. If any populations of South Coast Range morning-glory are found on-site, adverse effects on these populations should be avoided. This can be accomplished by avoiding the populations during project implementation or by developing and implementing a mitigation plan in cooperation with DFG and USFWS.

Wildlife

Wildlife species evaluated in this report include vernal pool tadpole shrimp (*Lepidurus packardi*), vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), California red-legged frog (*Rana aurora draytoni*), bald eagle (*Haliaeetus leucocephalus*), little willow flycatcher (*Empidonax trailii brewsteri*), San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia silus*), San

Table 1. Special-Status Plant Species that Could Occur or Are Known to Occur in the Friant-Kern Canal Restoration Site or the Water Transfer Plan Areas

Common Name Scientific Name	Status[a] Fed/State/CNPS	California Distribution	Habitat	Period Identifiable	Occurrence in Study Area
Bodie Hill rockcress[b] *Arabis bodiensis*	SC/--/1B	Fresno, Inyo, Mono, and Tulare Counties; adjacent Nevada	Rock crevices and open slopes in Great Basin scrub, pinyon-juniper woodland, and possibly in subalpine conifer forest at an elevation of 8,200 to 10,168 feet	June - August	No suitable habitat
Brittlescale *Atriplex depressa*	--/--/1B	Alameda, Contra Costa, Colusa, Fresno, Glenn, Kern, Madera, Merced, Solano, Tulare, and Yolo Counties; extirpated from Stanislaus County	Alkaline and clay soils in chenopod scrub, playas, and valley and foothill grassland below 660 feet; rarely in vernal pools	May - October	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
California jewelflower *Caulanthus californicus*	E/E/1B	Fresno, Kern, Santa Barbara, and San Luis Obisbo Counties; extirpated from Kings and Tulare Counties	Non-alkaline grassland, chenopod scrub, open pinyon-juniper woodland, valley and foothill grassland; on flats and gentle slopes between 210 feet and 3,300 feet elevation	February - May	No records; suitable habitat occurs at the restoration site
Delta tule pea[b] *Lathyrus jepsonii* var. *jepsonii*	SC/--/1B	Alameda, Contra Costa, Fresno, Marin, Napa, Sacramento, San Benito, San Clemente, San Joaquin, and Solano Counties	Coastal and estuarine freshwater and brackish marshes below an elevation of 10 feet	May - June	No suitable habitat
Fleshy owl's clover[b] *Castilleja campestris* ssp. *succulenta*	T/E/1B	Fresno, Madera, Merced, Mariposa, and Stanislaus Counties	Vernal pools and other moist places in annual grassland below an elevation of 7,545 feet	April - May	No suitable habitat
Forked fiddleneck *Amsinkia vernicosa* var. *furcata*	SC/--/4	Fresno, Kings, Kern, San Benito, and San Luis Obisbo Counties	Shale slopes in woodland and valley and foothill grassland between 150 and 3,300 feet elevation	March - May	No records; suitable habitat occurs at the restoration site
Fresno County bird's beak[b] *Cordylanthus tenuis* ssp. *barbatus*	SC/--/4	Known only from Fresno County	Open areas in lower montane coniferous forest at an elevation of 4,265 to 6,560 feet	July - August	No suitable habitat. Project site below elevational range.
Greene's tuctoria[b] *Tuctoria greenei*	E/R/1B	Butte, Merced, Shasta, and Tehama Counties; extirpated from Fresno, Madera, San Joaquin, and Tulare Counties	Well developed vernal pools in annual grassland below an elevation of 560 feet	May - July	No suitable habitat
Hartweg's golden sunburst *Pseudobahia bahiifolia*	E/E/1B	Fresno, Madera, and Stanislaus Counties; extirpated from Sutter and Yuba Counties	Valley and foothill grassland that is interspersed with vernal pools; around 500 feet elevation	March - April	No records; occurrence highly unlikely because of lack of alluvial fan or vernal pool habitat at the restoration site

Table 1. Continued

Common Name Scientific Name	Status[a] Fed/State/CNPS	California Distribution	Habitat	Period Identifiable	Occurrence in Study Area
Heartscale *Atriplex cordulata*	SC/--/1B	Alameda, Butte, Fresno, Glenn, Kings, Kern, Madera, Merced, Solano, and Tulare Counties; extirpated from Contra Costa, San Joaquin and Stanislaus Counties	Alkali grasslands on saline and alkaline soils in and around scald areas; chenopod scrub, valley and foothill grassland below 660 feet	May - October	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Hoover's eriastrum *Eriastrum hooveri*	T/--/4	Fresno, Kings, Kern, Santa Barbara, San Benito, San Luis Obisbo, and Tulare Counties	Chenopod scrub, valley and foothill grassland habitat; on mound tops in sparsely vegetated alkaline aluvium fans on sandy soils	April - July	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Keck's checkerbloom *Sidalcea keckii*	PE/--/1B	Tulare County	Grassy serpentine slopes in oak woodland and valley and foothill grassland at approximately 1,300 feet elevation	April	No records; occurrence highly unlikely because of the lack of serpentine substrates at the restoration site and the plant's dubious occurrence in Fresno County
Lesser saltbush *Atriplex minuscula*	--/--/1B	Fresno, Kern, and Madera Counties; extirpated from Merced and Tulare Counties	Sandy and alkaline soils in chenopod scrub, playas, and valley and foothill grassland habitats below 660 feet	May - October	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Long-petaled lewisia[b] *Lewisia longipetala*	SC/--/1B	El Dorado, Fresno, Nevada, and Placer Counties	Crevices associated with moist, rocky areas in alpine boulder and rock fields and subalpine coniferous forest at an elevation of 8,200 to 9,185 feet	July - August	No suitable habitat
Lost Hills crownscale *Atriplex vallicola*	SC/--/1B	Fresno, Kings, Kern, Merced, and San Luis Obisbo Counties	Dried ponds and alkaline soils in vernal pools, chenopod scrub, and valley and foothill grassland below 660 feet	May - August	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Mariposa pussypaws *Calyptridium pulchellum*	PE/--/1B	Fresno, Madera, and Mariposa County	Sandy soils and decomposed granite in oak woodland between 1,300 and 3,600 feet elevation	April - May	No records; occurrence highly unlikely because of the lack of suitable habitat at the restoration site and the different elevational range
Mono Hot Springs evening primrose[b] *Camissonia sierrae* ssp. *alticola*	SC/--/1B	Fresno and Mariposa Counties	Shallow, often gravelly soil on granite outcrops in ponderosa pine forest at approximately an elevation of 7,220 feet	June - August	No suitable habitat. Project site below elevational range.

Table 1. Continued

Common Name Scientific Name	Status[a] Fed/State/CNPS	California Distribution	Habitat	Period Identifiable	Occurrence in Study Area
Mouse buckwheat *Eriogonum nudum* var. *murinum*	SC/--/1B	Fresno and Tulare Counties	On dry sandy slopes in chaparral, oak woodland, and valley and foothill grassland between 1,700 and 2,700 feet elevation	June - November	No records; occurrence unlikely because the restoration site is below elevational range
Obovate-leaved thornmint *Acanthomintha obovata* ssp. *obovata*	SC/--/4	Fresno, Monterey, San Benito, and San Luis Obispo Counties	Heavy clay, alkaline, and serpentine substrates in grassy slopes, oak woodland, and chaparral below 5,000 feet elevation	April - June	No records; suitable habitat occurs at the restoration site
Orange lupine *Lupinus citrinus* var. *citrinus*	SC/--/1B	Fresno and Madera Counties	Edges and soil pockets of granite outcrops in openings within ponderosa pine forest, chaparral, or oak woodlands from 2,000 to 5,000 feet elevation	April - July	No records; occurrence highly unlikely because of the lack of suitable habitat at the restoration site
Pale-yellow layia *Layia heterotricha*	SC/--/1B	Santa Barbara County; extirpated from Fresno, Kings, Kern, Monterey, San Luis Obisbo, and possibly San Benito and Ventura Counties	Alkaline or clay soils in open areas of oak woodlands, pinjon-juniper woodlands and valley and foothill grassland below 5,300 feet elevation	March - June	No records; suitable habitat occurs at the restoration site
Palmate bird's-beak *Cordylanthus palmatus*	E/E/1B	Alameda, Colusa, Fresno, and Yolo Counties; extirpated from Madera and San Joaquin Counties	Alkaline flats in chenopod scrub and valley and foothill grassland below 200 feet	May - October	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Panoche peppergrass[b] *Lepidium jaredii* var. *album*	SC/--/1B	Fresno, San Benito, and Solano Counties	Alluvial fans, slopes, washes, and alkali bottoms in valley and foot-hill grassland below an elevation of 1,640 feet	February - June	No suitable habitat
Parasol clover[b] *Trifolium bolanderi*	SC/--/4	Fresno, Madera, and Mariposa Counties	Moist areas and meadows in lower and upper montane coniferous forest at an elevation of 6,880 to 7,545 feet	June - August	No suitable habitat. Project site below elevational range.
Raven's milk vetch[b] *Astragalus monoensis* ssp. *ravenii*	SC/R/1B	Fresno, Inyo, and Mono Counties	Open areas with pumice sand or gravel in alpine boulder or rock fields or gravelly areas in upper montane conifer forest at an elevation of 7,380 to 7,875 feet	July - September	No suitable habitat

Table 1. Continued

Common Name Scientific Name	Status[a] Fed/State/CNPS	California Distribution	Habitat	Period Identifiable	Occurrence in Study Area
Rayless layia[b] *Layia discoidea*	SC/--/1B	Fresno and San Benito Counties	Talus and alluvial terraces, often on serpentine substrates in chaparral, cismontane woodland, and lower coniferous forest at an elevation of 2,950 to 4,920 feet	May	No suitable habitat
Recurved larkspur *Delphinium recurvatum*	SC/--/1B	Alameda, Contra Costa, Colusa, Fresno, Kings, Kern, Merced, San Luis Obispo, Solano, and Tulare Counties	Poorly drained, fine, alkaline soils in chenopod scrub, valley and foothill grassland, cismontane woodland, and vernal pools	March - May	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
San Benito evening-primrose *Camissonia benitensis*	T/--/1B	Fresno and San Benito Counties	Clay or gravelly serpentine alluvial terraces in chaparral and oak woodland at approximately 2,000 feet elevation	May - June	No records; occurrence highly unlikely because of the lack of suitable habitat at the restoration site
San Benito spineflower *Chorizanthe biloba* var. *immemora*	SC/--/1B	Fresno, Monterey, and San Benito Counties	Non-serpentine, dry, oak woodland and chaparral between 2,000 and 2,700 feet elevation	May - September	No records; occurrence unlikely because the restoration site is below elevational range
San Joaquin adobe sunburst *Pseudobahia peirsonii*	T/E/1B	Fresno, Kern, and Tulare Counties	Bare, dark clay soils in valley and foothill grassland and oak woodland between 330 and 2,600 feet elevation	May - April	No records; suitable habitat occurs at the restoration site
San Joaquin orcutt grass[b] *Orcuttia inaequalis*	T/E/1B	Fresno, Madera, and Merced Counties; extirpated from Stanislaus and Tulare Counties	Well developed vernal pools in annual grassland below an elevation of 560 feet	May - September	No suitable habitat
San Joaquin woolly threads *Lembertia congdonii*	E/--/1B	Fresno, Kern, Santa Barbara, San Benito, and San Luis Obisbo Counties; extirpated from Kings and Tulare Counties	Alkaline and loamy plains in chenopod scrub, sandy valley, and foothill grassland at 300 to 2,300 feet above sea level	March - May	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
South Coast Range morning-glory *Calystegia collina* ssp. *venusta*	SC/--/4	Fresno, Monterey, Santa Barbara, and San Benito Counties	On sedimentary or serpentinite substrates in valley and foothill grassland, chaparral, or open oak-pine woods below 2,000 feet elevation	May - June	No records; suitable habitat occurs at the restoration site
Spiny-sepaled coyote thistle[b] *Eryngium spinosepalum*	SC/--/1B	Fresno, Madera, Stanislaus, and Tulare Counties	Vernal pools and other wet depressions in valley and foothill grassland at an elevation of 325 to 660 feet	April - May	No suitable habitat

Table 1. Continued

Common Name Scientific Name	Status[a] Fed/State/CNPS	California Distribution	Habitat	Period Identifiable	Occurrence in Study Area
Tree-anemone *Carpenteria californica*	PT/T/1B	Fresno County	On streambanks and granite substrates in chaparral and oak woodland between 1,500 and 3,300 feet elevation	May - July	No records; suitable habitat occurs at the restoration site
Valley sagittaria[b] *Sagittaria sanfordii*	SC/--/1B	Butte, Del Norte, Fresno, Kern, Merced, Marin, Sacramento, Shasta, San Joaquin, and Tehama Counties; extirpated from Orange and Ventura Counties	Shallow, freshwater marshy areas, ponds, and ditches below an elevation of 985 feet	May - August	Marginal habitat

[a] Status explanations (see the "Definitions of Special-Status Species" section above for citations):

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
PE = proposed for federal listing as endangered under the federal Endangered Species Act.
PT = proposed for federal listing as threatened under the federal Endangered Species Act.
SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.
-- = no listing.

State

E = listed as endangered under the California Endangered Species Act.
-- = no listing.

California Native Plant Society

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
4 = List 4 species: plants of limited distribution.

[b] Species that occur on the USFWS list that were not evaluated in the report because they do not occur within the geographic area of the project or no suitable habitat was present within the project area to support the species.

Joaquin (Nelson's) antelope squirrel (*Ammospermophilus nelsoni*), Fresno kangaroo rat (*Dipodomys nitratoides exilis*), and western burrowing owl (*Athene cunicularia hypugea*) (Table 2).

Several special-status wildlife species that are not federally or state listed as threatened or endangered are known to occur in the project vicinity (Natural Diversity Data Base 1997b) (Table 2). The southwestern pond turtle (*Clemmys marmorata pallida*), foothill yellow-legged frog (*Rana boylii*), spotted bat (*Euderma maculatum*), prairie falcon (*Falco mexicanus*), and California spotted owl (*Strix occidentalis occidentalis*) have been recorded in the Pine Flat Reservoir area. The increased cover from habitat restoration activities at the Friant-Kern Canal restoration site could benefit the southwestern pond turtle and spotted bat. There would probably be no adverse effects or benefits to the foothill yellow-legged frog and prairie falcon because they do not use woodland habitats in the project area for feeding or breeding. California spotted owls are known to occur in montane riparian habitats at the upstream portion of the reservoir but it is highly unlikely they occur in woodland habitat below the reservoir. The project would have no affect on this species.

Several special-status species not known to occur at the Friant-Kern Canal restoration site could occupy the site based on the presence of suitable habitat (Table 2). The California horned lizard (*Phrynosoma coronatum frontale*), greater mastiff bat (*Eumops perotis californicus*), small-footed myotis (*Myotis ciliolabrum*), Pacific Townsend's big-eared bat (*Plecotus townsendii townsendii*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), and Yuman myotis (*Myotis yumanensis*). Habitat restoration activities at the site could benefit these species by increasing the habitat value.

Four special-status wildlife species, including San Joaquin pocket mouse (*Perognathus inornatus*), molestan blister beetle (*Lytta molesta*), moestan blister beetle (*Lytta moesta*), and Morrison's blister beetle (*Lytta morrisoni*), could occur in the water transfer pipeline corridors (Table 2). The San Joaquin pocket mouse was identified in the Natural Diversity Data Base (NDDB) as occurring 1 mile east of Mendota in 1918. The range of the San Joaquin pocket mouse may include the water transfer pipeline corridors. The alkali habitat areas along Alternatives 1 and 2 and Option 1A are potential habitats for San Joaquin pocket mice. These alkali habitat areas are disturbed, small in area, surrounded by intensive agriculture (e.g., alfalfa and orchards), and isolated from other suitable habitats. It is unlikely that the San Joaquin pocket mouse is present because it would be difficult to maintain a viable population at these sites. Therefore, this species probably would not be affected by construction of the project.

The alkali habitats along the water transfer pipeline Alternatives 1 and 2 and Option 1A are potentially suitable habitats for the molestan blister beetle, moestan blister beetle, and the Morrison's blister beetle (Table 2). These species are designated as federal species of concern. Although the alkali habitats are fragmented and isolated by orchards and alfalfa fields, remnant populations of these beetles could occupy these habitats. If these beetles are present, they could

be adversely affected by construction activities and the loss of habitat. Surveys conducted during spring (April-June) by a qualified entomologist could determine presence or absence of these species. If these species are present and the alkali habitats cannot be avoided, the USFWS should be consulted to determine the appropriate mitigation, which could include compensation for the loss of alkali habitat.

Alternatives 1 and 2 and Option 1A could provide marginal-quality habitat for the San Joaquin whipsnake (*Masticophis flagellum ruddocki*) (Table 2). Because of the habitat in this area is fragmented, it is unlikely that the San Joaquin whipsnake exists along the alignment.

Several species that occur on the USFWS list and are included in Table 2, were not evaluated because they do not occur within the geographic area of the project or no suitable habitat was present within the project area to support the species. Species not evaluated include Sierra pigmy grasshopper (*Tetrix sierrana*), San Joaquin tiger beetle (*Cicindela tranquebarica* ssp.), San Joaquin dune beetle (*Coelus gracilis*), Ciervo aegianlian scarab (*Aegialia concinna*), California tiger salamander (*Ambystoma californiense*), western spadefoot toad (*Scaphiopus hammondii*), Yosemite toad (*Bufo canopus*), mountain yellow-legged frog (*Rana muscosa*), silvery legless lizard (*Anniella pulchra pulchra*), northwestern pond turtle (*Clemmys marmorata marmorata*), giant garter snake (*Thamnophis gigas*), northern goshawk (*Accipiter gentilis*), American peregrine falcon (*Falco peregrinus anatum*), California condor (*Gymnogyps californianus*), white-faced ibis (*Plegadis chihi*), Aleutian Canada goose (*Branta canadensis leucopareia*), mountain plover (*Charadrius montanus*), tricolored blackbird (*Agelaius tricolor*), Mount Lyell shrew (*Sorex lyelli*), San Joaquin Valley woodrat (*Neotoma fuscipes riparia*), short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), giant kangaroo rat (*Dipodomys ingens*), southern grasshopper mouse (*Onychomys torridus*), Tulare grasshopper mouse (*Onychomys torridus tularensis*), California wolverine (*Gulo gulo tuteus*), Pacific fisher (*Martes pennanti pacifica*), Sierra Nevada red fox (*Vulpes vulpes necator*), and California bighorn sheep (*Ovis canadensis californiana*).

Vernal Pool Tadpole Shrimp (*Lepidurus packardi*) and Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

Family: Anostraca

Legal Status: The vernal pool tadpole shrimp is listed as an endangered species under the federal ESA, while the vernal pool fairy shrimp is listed as threatened.

Habitat. The vernal pool tadpole shrimp occurs in vernal pool complexes. These complexes are found in grass-bottomed swales on old alluvial soils that are underlain by hardpan or mud-bottomed pools that contain highly turbid water (59 FR 48136-48153, September 16, 1994). These shrimp have also been observed in stock ponds and other seasonal wetlands. Pools

that are occupied by the species typically have low conductivity, total dissolved solids (TDS), and alkalinity (59 FR 48136-48153, September 16, 1994). Jones & Stokes Associates' file data indicate that the vernal pool tadpole shrimp often occurs with the Conservancy fairy shrimp (*Branchinecta conservatio*), vernal pool fairy shrimp, and California linderiella (*Linderiella occidentalis*).

The life history of the vernal pool tadpole shrimp is linked to the phenology of its vernal pool habitat. When pools are dry, the species' diapaused eggs lie dormant in the dry pool sediments. After winter rainwater fills the pools, populations of the species are reestablished from the diapaused eggs (Lanway 1974, Ahl 1991). Unlike the eggs of many of the fairy shrimp species, the eggs of the vernal pool tadpole shrimp do not require a freezing or drying period to hatch (Ahl 1991). Adult shrimp are often present and reproducting in vernal pools until the pools dry up in spring (Ahl 1991; 59 FR 48136-48153, September 16, 1994). Vernal pool tadpole shrimp mature slowly and are long-lived (Ahl 1991).

The vernal pool fairy shrimp inhabits ephemeral pools with clear to tea-colored water. Occupied pools are usually in grass-bottomed or mud-bottomed swales or basalt flow depressions in unplowed grasslands (59 FR 48136-48153, September 16, 1994). The species is distributed sporadically within vernal pool complexes. Pools that are occupied by the species typically have low conductivity, TDS, alkalinity, and chloride (Collie and Lathrop 1976). The vernal pool fairy shrimp often occurs with the vernal pool tadpole shrimp and California linderiella. The vernal pool fairy shrimp is never the most abundant species when it is found with other shrimp species (Eng et al. 1990).

The vernal pool fairy shrimp has been observed in vernal pools from December to early May. This species can mature quickly and is able to persist in short-lived shallow pools (59 FR 48136-48153, September 16, 1994).

Distribution. The vernal pool tadpole shrimp is found in suitable habitats in the Central Valley from Shasta County to Merced County (59 FR 48136-48153, September 16, 1994). This species could also occur further south in the San Joaquin Valley where suitable vernal pools exist.

The vernal pool fairy shrimp is found at scattered locations in the Central Valley from Shasta County to Tulare County, along the Coast Range from Solano County to San Luis Obispo and Santa Barbara Counties, and in southern California in Riverside and San Diego Counties.

Endangerment. The loss of vernal wetlands is the primary cause for the decline of the vernal pool tadpole shrimp and vernal pool fairy shrimp. An estimated 90% of the suitable habitat for these species has been destroyed by human activities (e.g., commercial and residential development, agriculture, off-road vehicle use, water development projects, and flood control projects). Habitat loss has occurred not only from direct destruction and modification of vernal

pools but also from alterations in vernal pool watersheds caused by modification of surrounding uplands (59 FR 48136-48153, September 16, 1994).

Project Area Occurrence. There are no records of vernal pool tadpole shrimp or vernal pool fairy shrimp in the vicinity of the proposed water transfer pipeline. There is no suitable shrimp habitat in the Friant-Kern Canal restoration site. Potentially suitable habitat for vernal pool tadpole shrimp and vernal pool fairy shrimp was found in the alkali habitats along Alternatives 1 and 2 and Option 1A (Figure 4).

Project Impacts. If construction activities occur in the seasonal wetlands in the alkali habitats, vernal pool tadpole shrimp or vernal pool fairy shrimp could be directly or indirectly affected. Mortality could result from construction of the pipelines or from indirect effects, such as the placement of staging areas and dust. These potential impacts would have substantial impacts on these federally listed species.

Mitigation. The Corps should conduct protocol-level vernal pool fairy shrimp and vernal pool tadpole shrimp surveys in the seasonal wetlands in the alkali habitats to determine if these species are present. The USFWS survey protocols require surveys every 2 weeks for 2 years during the rainy season. If one of these species is detected in the affected area, the surveys can be stopped and the pools would be considered occupied. If none of these species are found, then the Corps will consult with USFWS on the vernal pool crustaceans to determine if additional mitigation may be required. Adverse effects to the vernal pool wetlands would also be reviewed by the Corps regulatory branch.

If the Corps prefers not to perform the 2 years of surveys, they could assume the pools are occupied by listed fairy shrimp. The Corps could begin mitigation, which could include avoidance of the impacts or mitigating for the loss of habitat.

The Corps could compensate for direct effects on vernal pool fairy shrimp and vernal pool tadpole shrimp habitat. This compensation would be achieved by implementing the following mitigation measures, as described in the programmatic agreement between USFWS and the Corps:

- Create suitable tadpole and fairy shrimp habitat at a 1:1 ratio for the vernal pool/seasonal wetland habitat disturbed by the project. This acreage has not been determined. The habitat must be created at a location approved by the USFWS.

- Preserve suitable fairy and tadpole shrimp habitat at a 2:1 ratio. This acreage also has not been determined. The habitat must be preserved at a location approved by the USFWS.

- Before construction starts, the Corps will obtain authorization from the USFWS to

take listed tadpole and fairy shrimp species that would be affected by the project. Under the federal ESA, a biological opinion is required from the USFWS before construction begins.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)

Family: Cerambycidae

Legal Status: The valley elderberry longhorn beetle (VELB) is federally listed as a threatened species.

Habitat. VELB is closely associated with blue elderberry (*Sambucus mexicana*), an obligate host for beetle larvae. The life history of VELB is assumed to follow a sequence of events similar to those of related taxa. Female beetles deposit eggs in crevices in the bark of living elderberry plants. Presumably, the eggs hatch shortly after they are laid and the larvae bore into the pith of the trunk or stem. When larvae are ready to pupate, they move through the pith of the plant, open an emergence hole through the bark, and return to the pith for pupation. Adults exit through the emergence holes and can sometimes be found on elderberry foliage, flowers, or stems, or on adjacent vegetation. The entire life cycle of VELB is thought to encompass 2 years from the time eggs are laid and hatch until adults emerge and die (U.S. Fish and Wildlife Service 1984).

The presence of emergence holes in elderberry stems indicates previous VELB habitat use. Emergence holes are cylindrical and approximately 0.25 inch (0.6 cm) in diameter. Emergence holes can be found on stems that are 1-8 inches (2.5-20.3 cm) in diameter. The holes may be on the stems from a few inches above the ground to approximately 9-10 feet (2.7-3.0 m) above the ground (Barr 1991).

Information on the inundation response of VELB and elderberry shrubs in natural and artificial drainages is lacking. According to Walters et al. (1980), blue elderberry can withstand flooding for 1-3 months during the growing season. However, others believe this level of flood tolerance may have been overestimated (Scammel-Tinling and Knudson 1991).

Distribution. VELB has probably always been rare and of limited abundance (U.S. Fish and Wildlife Service 1984). Information on the historical distribution and abundance of VELB is scarce. The substantial reduction in Central Valley riparian vegetation in the last 150 years suggests that the beetle's range has contracted and that remaining populations are discontinuous (U.S. Fish and Wildlife Service 1984).

VELB was first described in 1921 from specimens collected in Sacramento (U.S. Fish and Wildlife Service 1984). By 1984, VELB was known from only three Central Valley

drainages: Merced River, Putah Creek, and American River. Additional field surveys in the 1980s detected new locations of VELB through collections of adult beetles or observations of emergence holes in blue elderberry stems. The new locations included the Yuba, American, Cosumnes, Sacramento, Mokelumne, Calaveras, San Joaquin, Middle, Tuolumne, Stanislaus, and Merced Rivers.

The VELB's range extends from Redding at the northern end of the Central Valley south to the Bakersfield area (Barr 1991). Along the eastern edge of the species' range, adult beetles have been found in the foothills of the Sierra Nevada Range at elevations up to 2,220 feet (676.8 m), and beetle emergence holes have been observed on elderberry plants at elevations up to 2,940 feet (896.3 m). Along the western edge of the species' range, adult beetles have been found on the eastern slope of the Coast Range at elevations up to 500 feet (152.4 m), and beetle emergence holes have been observed on elderberry plants at elevations up to 730 feet (222.6 m) (Barr 1991).

Only limited information on VELB population and distribution is available. Therefore, it is not possible to accurately assess the population status. Based on the extent of habitat loss in the Central Valley, it is likely that populations have declined.

Endangerment. Although the historical abundance of VELB is unknown, extensive loss of riparian forests in the Central Valley during the past 150 years has reduced the amount of habitat available for the species and likely decreased and fragmented their range (U.S. Fish and Wildlife Service 1984). Insecticide drift from cultivated fields and orchards adjacent to elderberry shrubs could affect VELB populations if drift occurs when adults are present on the shrubs (Barr 1991). Furthermore, herbicide drift from agricultural fields and orchards could affect the health of elderberry shrubs and thereby reduce the quantity and quality of VELB habitat.

Project Area Occurrence. There are no current or historic records of VELB in either the Friant-Kern Canal restoration site or the water transfer pipeline corridors. There is potentially suitable VELB habitat (elderberry shrubs) in the Friant-Kern Canal restoration site, but no adult beetles or emergence holes were observed during field surveys.

Project Impacts. No adverse impacts on VELB are expected because no elderberry shrubs would be disturbed by habitat restoration at the Friant-Kern Canal restoration site. Also, wildlife habitat restoration could have beneficial effects on VELB by increasing cover for the beetle.

There would be no adverse effects on VELB in the Water transfer pipeline corridors because no VELB habitat is present.

Mitigation. No mitigation is required.

California Red-Legged Frog (*Rana aurora draytoni*)

Family: Ranidae

Legal Status: The California red-legged frog is federally listed as threatened and is designated as a state species of special concern (California Department of Fish and Game 1994).

Habitat. California red-legged frogs are usually found near ponds, creeks, marshes, and other vegetated wetlands but may disperse far from water following breeding (Stebbins 1985, Zeiner et al. 1988). Adult red-legged frogs are highly aquatic when active but are less dependent on permanent water bodies than are other frog species (Brode and Bury 1984). During dry periods, adults may estivate in rodent holes or cracks in the soil.

California red-legged frogs require permanent or nearly permanent ponded water habitat, including stock ponds and pools within streams, with emergent and submergent vegetation (Storer 1925, Stebbins 1972). The highest densities of California red-legged frogs occur in deep-water ponds (i.e., at least 3 feet [0.9 m] deep) with dense stands of overhanging willows (*Salix* spp.) and fringes of cattails (*Typha* sp.) (Hayes and Jennings 1988; Jennings 1988; 59 FR 4888-4895, February 2, 1994). California red-legged frogs occur most frequently in intermittent waters that lack bullfrogs (*Rana catesbeiana*) and introduced fish species (Hayes and Jennings 1988).

California red-legged frogs lay their eggs from December to early April. The egg clusters are deposited around aquatic vegetation. The larvae require approximately 3–5 months to complete metamorphosis (Storer 1925).

The diet of the California red-legged frog is highly variable. Invertebrates have been reported as the most common food item. However, Hayes and Tennant (1985) noted that larger frogs consumed a significant amount of vertebrate prey, including Pacific tree frogs (*Pseudacris regilla*) and deer mice (*Peromyscus maniculatus*).

Distribution. Historically, the California red-legged frog was found in scattered populations throughout much of the California lowlands west of the Sierra Nevada (Stebbins 1972). Its historical range extended from Point Reyes in coastal Marin County, inland to Redding in Shasta County, and south to northwestern Baja California (57 FR 45761-45762, October 5, 1992). The species has been extirpated from approximately 75% of its historical range (57 FR 45761-45762, October 5, 1992), including the floor of the Central Valley and probably more than half of the drainage systems in the Central Valley (Hayes and Jennings 1986).

Currently, the California red-legged frog is considered rare in the central Sierra Nevada,

extirpated from the southern Sierra Nevada and Central Valley, and declining in the Coast Ranges (Stebbins 1985, Hayes and Jennings 1986). Only three locations are known to support large breeding populations of the California red-legged frog (57 FR 45761-45762, October 5, 1992). Remaining populations are threatened by the continued loss of stream and wetland habitats.

Endangerment. California red-legged frog populations have declined primarily from habitat loss, overharvest, and the introduction of bullfrogs and various game fish species (Moyle 1976), Stebbins 1985, Hayes and Jennings 1988). Certain areas, such as the San Joaquin Valley, were particularly affected by wetland reclamation and species harvest (Jennings and Hayes 1984).

The introduction of the bullfrog has resulted in the extirpation of many California red-legged frog populations throughout their range (57 FR 45761-45762, October 5, 1992; Jennings pers. comm.) and is considered the most important factor in the elimination of California red-legged frogs from the floor of the Central Valley (Moyle 1973). The bullfrog preys on the smaller red-legged frogs and competes for food limited resources, including food. Although the number of permanent ponds in the Central Valley below an elevation of 4,500 feet (1,372 m) has increased, most California red-legged frog populations are found in intermittent waters. Hayes and Jennings (1988) suggested that red-legged frog populations may be uncommon in these permanent ponds because of the presence of bullfrogs and non-native fishes.

Project Area Occurrence. There are no recent or historical records of the California red-legged frog occurring in the study areas. Potentially suitable riverine and riparian habitats occur at the Friant-Kern Canal restoration site, but no suitable habitat exists at the water transfer pipeline corridors. No red-legged frogs were observed during reconnaissance-level surveys in the affected areas. Although there have been no recent records in the affected area, this does not preclude them from occurring in the restoration area.

Project Impacts. Wildlife habitat restoration at the Friant-Kern Canal restoration site would have no adverse effects on the California red-legged frog, but it could have beneficial effects by increasing riparian habitat cover.

Mitigation. No mitigation is required.

Bald Eagle (*Haliaeetus leucocephalus*)

Family: Accipitridae

Legal Status: The bald eagle is federally listed as a threatened species and state listed as an endangered species.

Habitat. Bald eagle nesting territories in California are found primarily in ponderosa pine and mixed conifer forests (Lehman 1979). The ponderosa pine is most often used for nesting (Lehman 1979), although nest sites have been observed in a variety of tree species (Jurek 1988).

Bald eagle nest sites are always associated with a lake, river, or within 1 mile (1.6 km) of a water body. Nests are usually constructed in a tree that provides an unobstructed view of the water body and almost always is the dominant or codominant tree in the surrounding stand (Lehman 1979). Providing perch and roost sites, snags and dead-topped live trees are important habitat components in a bald eagle nesting territory.

Bald eagles winter along rivers, lakes, and reservoirs that support adequate fish or waterbird prey and have mature trees or large snags available for perch sites. Bald eagles often roost communally during the winter in mature trees or snags with open branching structures. Bald eagle winter roost areas are usually isolated from human disturbance.

Distribution. Historically, the bald eagle nested throughout California; however, the current nesting distribution is mostly restricted to mountainous habitats in the northern third of the state, primarily in the northern Sierra Nevada, Cascade Range, and northern Coast Ranges (California Department of Fish and Game 1992, 1994). Bald eagles have been nesting at Eastmen Lake in Madera County since the early 1990s (Beauregard pers. comm.). Recently, bald eagles have nested in mainland southern California and on Santa Catalina Island. Bald eagles winter at lakes, reservoirs, and along river systems throughout most of central and northern California and in a few southern California localities (California Department of Fish and Game 1992, 1994). Wintering bald eagles commonly occur at various reservoirs along the Sierra Nevada foothills of the San Joaquin Valley (Beauregard pers. comm.).

Endangerment. The breeding population of bald eagles in California is increasing in both numbers and range, and the winter population appears stable. In 1981, 50 breeding bald eagle pairs were known to occupy territories in California. By 1990, the number of breeding bald eagle pairs in the state had increased to 93. In 1991, it was 90 and by 1992, it had reached 99. In 1981, the bald eagle breeding range in California included portions of eight counties. By the early 1990s, the breeding range in California had expanded to portions of 19 counties. Although the winter population of bald eagles in California varies from year to year, it can exceed 1,000 birds in some winters (California Department of Fish and Game 1994).

Because the population status of the bald eagle improved in most of the country, the USFWS upgraded the federal status for much of the national population, including the Pacific states populations, from endangered to threatened (60 FR 36000-36010, July 12, 1995).

Early declines in bald eagle populations have been attributed to human persecution and destruction of riparian, wetland, and coniferous forest habitats (Detrich 1985). The most

important factor that contributed to the decline of bald eagle populations, however, was environmental contamination resulting from the introduction of dichloro-diphenyl-dichloroethylene (DDE), a metabolite of the agricultural pesticide dichloro-diphenyl-trichloroethane (DDT), into the food chain (Detrich 1985).

By 1972, there were only 26 known active bald eagle territories in California (Thelander 1973). Various legal and management measures, including the banning of DDT in 1972, the development and implementation of the Pacific Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service 1986), and local bald eagle management plans, have contributed to the continuing recovery of bald eagle breeding populations in California since 1973 (California Department of Fish and Game 1992).

Project Area Occurrence. The nearest known bald eagle nest to the project sites is at Eastman Lake in Madera County, approximately 40 miles north of Pine Flat Reservoir (Beauregard pers. comm.). The Friant-Kern Canal restoration site is considered potential bald eagle roosting habitat and the Pine Flat Reservoir is considered suitable foraging habitat for wintering bald eagles. There are no bald eagle nesting records in the Pine Flat Reservoir area, but wintering eagles probably occur there in winter. The water transfer pipeline corridor is unsuitable bald eagle habitat.

Project Impacts. Construction of the multilevel intake structure would occur on the reservoir side of the dam. Because construction activities would be confined to the dam structure , implementation of the multilevel intake structure would not substantially disturb wintering bald eagles at the reservoir. Implementation of the Friant-Kern Canal restoration site would have no adverse impacts on bald eagles because there would not be a substantial disturbance to potential bald eagles wintering in the area.

Implementation of the water transfer pipeline measure would have no adverse effects on bald eagles because there is no suitable habitat present.

Mitigation. No mitigation is required.

Little Willow Flycatcher (*Empidonax traillii brewsteri*)

Family: Tyrannidae

Legal Status: The willow flycatcher (*Empidonax traillii*) is listed as endangered under the California ESA and the little willow flycatcher is a federal species of concern.

Habitat. This subspecies of willow flycatcher primarily inhabits willows in riparian deciduous shrub habitat. Wet meadows appear to be the most common habitat used in the Sierra

Nevada, but riparian deciduous shrubs along streams are also used. They have been found to use riparian habitats of various types and sizes, ranging from small willow-surrounded lakes or ponds with a fringe of meadow or grassland to willow-lined streams, grasslands, or boggy areas.

Distribution. The willow flycatcher population in California is very fragmented, and the little willow flycatcher nesting population in the Sierra Nevada occurs in small, isolated subpopulations.

Endangerment. Willow flycatcher populations have declined for a variety of reasons, including brown-headed cowbird nest parasitizism, livestock grazing in meadows and riparian habitats, and the loss and fragmentation of riparian and wetland habitats.

Project Area Occurrence. The nearest known little willow flycatcher nesting population to the two project sites is near Shaver Lake, Fresno County, approximately 25 miles north of the Friant-Kern Canal restoration site. Other known willow flycatcher locations are above 4,800 feet in elevation in Fresno County (Natural Diversity Data Base 1997b).

The Friant-Kern Canal restoration site lacks extensive willow habitat in riparian areas and is at a much lower elevation than recorded sitings. It is unlikely that the willow flycatcher occurs in restoration area, although it could occur there during the spring or fall migration. The water transfer pipeline corridors do not support willow flycatcher habitat.

Project Impacts. There would be no adverse effects on the little willow flycatcher in the Friant-Kern Canal restoration site because it is not expected to nest there, although habitat restoration could improve foraging habitat for willow flycatchers during migration. There would be no impacts on willow flycatchers in the water transfer pipeline corridors because there is no suitable habitat for nesting.

Mitigation. No mitigation is required.

San Joaquin Kit Fox (*Vulpes macrotis mutica*)

Family: Canidae

Legal Status: The San Joaquin kit fox is federally listed as endangered and state listed as threatened.

Habitat. The San Joaquin kit fox is a permanent resident of arid regions in the southern half of California (California Department of Fish and Game 1990:288). The kit fox lives in annual grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs, and scrub (California Department of Fish and Game 1990:288). Before the rapid expansion of

irrigated agriculture in the San Joaquin Valley, the San Joaquin saltbush (*Atriplex joaquiniana*) was probably prime habitat for the kit fox (Grinnell et al. 1937).

Distribution. The historic range of the San Joaquin kit fox included most of the San Joaquin Valley from Tracy in San Joaquin County to southern Kern County (California Department of Fish and Game 1991:32-33). By 1930, this range could have already been reduced by 50%, and kit foxes that formerly occupied portions of their northern, northeastern, and eastern range were restricted to the southern and western parts of the San Joaquin Valley. Kit foxes occur in the remaining native vegetation associated with the valley floor and surrounding foothills from southern Kern County, north to Los Banos in Merced County. Depending on extent of agricultural development, distribution is scattered within this broad range. In addition, smaller, less dense populations may be found further north and in the narrow corridor between Interstate 5 and the interior Coast Range from Los Banos to Contra Costa County. Portions of Monterey, Santa Clara, San Benito, and Santa Barbara Counties are also included in the range of the San Joaquin kit fox.

Endangerment. Loss of habitat is because of urban expansion onto surrounding agricultural land, expansion of intensive agriculture, and extensive petroleum exploration operations (California Department of Fish and Game 1991). Residential developments and public works projects, such as reservoirs, decrease suitable habitat. The San Joaquin kit fox is also subject to disease, predation, roadkill, shooting, trapping, and rodenticide mortality.

Project Area Occurrence. The Friant-Kern Canal restoration is outside of the kit fox's range; however, the pipeline corridors are within the species' range. There is a 1972-1975 NDDB kit fox record in the vicinity of Jameson, which is within the vicinity of the of the water transfer pipeline corridors.

Suitable kit fox habitat is limited to alkali habitats along the Alternatives 1 and 2 and Option 1 A (Figure 4). These alkali habitats are small and isolated from other suitable habitat areas. Although no kit foxes were observed during the field surveys, they could be present in the alkali habitats along Alternatives 1 and 2 and Option 1A in the water transfer pipeline corridors.

Project Impacts. If San Joaquin kit foxes are present in the water transfer pipeline corridors, they could be adversely affected by construction activities along Alternatives 1 and 2 and Option 1A. Potential construction impacts of the pipeline include damage to or destruction of dens, direct mortality from construction vehicles or heavy equipment, direct mortality from den collapses and subsequent suffocation, temporary disturbance from noise and human presence associated with construction activities, and temporary loss of potentially suitable habitat. Because the San Joaquin kit fox is a state-listed and federally listed species, these potential impacts would be considered substantial.

Mitigation. To avoid potential impacts on the San Joaquin kit fox, the Corps would need

to conduct preconstruction surveys or implement the USFWS's standard recommendations for protection of the San Joaquin kit fox before and during ground disturbance (U.S. Fish and Wildlife Service 1997).

If San Joaquin kit foxes are found during the field surveys, the Corps should avoid impacts on this species. If this is not feasible, the Corps would need to consult DFG and USFWS to determine the appropriate mitigation measures, such as displacement of the animals and habitat compensation.

Blunt-Nosed Leopard Lizard (*Gambelia silus*)

Family: Iguanidae

Legal Status: The blunt-nosed leopard lizard is federally and state listed as an endangered species.

Habitat. Blunt-nosed leopard lizards inhabit sparsely vegetated plains, alkali flats, low foothills, grasslands, canyon floors, large washes, and arroyos (California Department of Fish and Game 1992, 1994) at elevations ranging from 100 to 3,000 feet (Zeiner et al. 1988). They usually occur in areas with low topographic relief. In areas of high topographic relief, blunt-nosed leopard lizards are usually confined to broad, sandy washes (Zeiner et al. 1988).

Blunt-nosed leopard lizards prefer areas with sandy soils, scattered low bushes, and 30-50% bare ground (Chesemore 1980). They are usually absent from areas with dense vegetation, presumably because the dense cover reduces the lizard's speed in locomotion and foraging (Snow 1972). Although blunt-nosed leopard lizards prefer areas with sandy soils, they are also found in areas with coarse, gravelly, or hardpan soils (Montanucci 1965, 1970; Snow 1972; Stebbins 1985). Dominant vegetation in blunt-nosed leopard lizard habitat includes iodine bush, bush seepweed, saltbush (Tollestrup 1979, Stebbins 1985), and grasses (Stebbins 1985).

These lizards require burrows for escape cover, hibernation, thermoregulation, and laying eggs. A close relationship has been suggested between the numbers of blunt-nosed leopard lizards and burrowing small mammals (Montanucci 1965, Dorff 1981). Blunt-nosed leopard lizards require shrubs for escape cover, foraging, and shade (U.S. Fish and Wildlife Service 1985). Washes and playas also provide escape cover and thermoregulation sites.

Blunt-nosed leopard lizards are carnivorous and feed primarily on large insects and small lizards, including leopard lizards (Zeiner et al. 1988). Their diet varies seasonally and regionally, depending on the abundance of insect and lizard prey (Montanucci 1965).

Distribution. Historically,blunt-nosed leopard lizards occurred throughout the San

Joaquin Valley and surrounding foothills from San Joaquin County, south to eastern San Luis Obispo County (Zeiner et al. 1988). Currently, the blunt-nosed leopard lizard occurs only in scattered locations in the San Joaquin Valley and in the eastern portions of the Coast Ranges, including the Antelope and Carrizo Plains and the Cuyama Valley (California Department of Fish and Game 1992, 1994). Population densities are generally lower in the northern portion of the species' range (EDAW and WESCO 1980).

In 1976, an estimated 228,000 acres (92,270 hectare [ha]) of blunt-nosed leopard lizard habitat remained in the San Joaquin Valley. By April 1980, this figure had been reduced to 158,000 acres (63,942 ha). DFG has acquired several ecological reserves that support blunt-nosed leopard lizard populations, and an interagency effort is under way to identify and protect important remaining habitats for the species in the San Joaquin Valley and Carrizo Plain. Although some progress toward the species' recovery has been made through habitat protection, the blunt-nosed leopard lizard populations are still declining (California Department of Fish and Game 1992, 1994).

Endangerment. Blunt-nosed leopard lizard populations have declined primarily from habitat loss to agriculture and urban development in the San Joaquin Valley (California Department of Fish and Game 1992, 1994). By 1979, only 7% of the San Joaquin Valley was considered as potentially suitable habitat for the species (O'Farrell et al. 1981). Historically, most of the San Joaquin Valley provided suitable habitat for the blunt-nosed leopard lizards.

Intensive cattle grazing may have contributed to the species' population decline by compacting soils, damaging rodent burrows, and denuding vegetation that provides cover for the blunt-nosed leopard lizard and its prey (U.S. Fish and Wildlife Service 1985). Rodent control programs that use fumigants (U.S. Fish and Wildlife Service 1985) and agricultural pest control operations that destroy insect prey (Montanucci 1965) may also have been factors in the blunt-nosed leopard lizard's population decline.

Project Area Occurrence. The Kern-Friant Canal restoration area is outside the blunt-nosed leopard lizards range; however, the water transfer pipeline corridors are within the species' known range. There are three records of blunt-nosed leopard lizards north of the water transfer pipelines corridors. The closest record is about 4 miles northeast of the water transfer pipeline corridors.

Suitable blunt-nosed leopard lizard habitat is limited to alkali habitats along Alternatives 1 and 2 and Option 1A along the pipeline corridors (Figure 4). These alkali habitats are small and isolated from other suitable habitat areas. Although no blunt-nosed leopard lizards were seen during the field surveys, they could be present in alkali habitats along Alternatives 1 and 2 and Option 1A in the water transfer pipeline corridors.

Project Impacts. If blunt-nosed leopard lizards are present along Alternatives 1 and 2

and Option 1 A in the water transfer pipeline corridors, then they could be adversely affected by construction activities. Potential construction impacts of the pipeline include damage to or destruction of burrows, direct mortality from construction vehicles or heavy equipment, direct mortality from burrow collapses and subsequent suffocation, temporary disturbance from noise and human presence associated with construction activities, and temporary loss of potential habitat. Because the blunt-nosed leopard lizard is a state-listed and federally listed species, these potential impacts would be considered substantial.

Mitigation. Preconstruction surveys for blunt-nosed leopard lizards should be conducted in and adjacent to alkali habitats along Alternatives 1 and 2 and Option 1 A before construction or any earth-moving activities begin. If blunt-nosed leopard lizards are found during the field surveys, the Corps should avoid impacts on this species. If this is not feasible, the Corps would need to consult DFG and USFWS to determine the appropriate mitigation measures, such as relocation of the lizards and habitat compensation.

San Joaquin (Nelson's) Antelope Squirrel (*Ammospermophilus nelsoni*)

Family: Sciuridae

Legal Status: The San Joaquin (Nelson's) antelope squirrel is considered a species of concern by USFWS and is state listed as threatened.

Habitat. San Joaquin antelope squirrels are usually found in dry grasslands with sandy loam soils, widely-spaced alkali scrub vegetation, and dry washes (Zeiner et al. 1990b). Typical shrub species found in antelope ground squirrel habitat include saltbush, green ephedra (*Ephedra viridis*), bladderpod (*Isomeris arborea*), and California matchweed (*Gutierrezia californica*). Low density populations of the San Joaquin antelope squirrel have been found in alkaline soil areas dominated by iodine bush and spiny saltbush (*Atriplex spinifera*) (California Department of Fish and Game 1992, 1994). Habitat features, such as scattered shrubs and arroyo banks, are probably important determinants of San Joaquin antelope squirrel distribution (Williams 1980). Hawbecker (1953) reported that the San Joaquin antelope squirrel does not occur in areas where the annual rainfall exceeds 9 inches.

San Joaquin antelope squirrels feed primarily on insects, seeds of grasses and forbs, green vegetation, and occasionally on small vertebrates (Hawbecker 1947, 1953). Insects are the predominant food item consumed from mid-May to mid-December while green vegetation from annual grasses and forbs constitutes the majority of the diet from mid-December to mid-May. Small vertebrates and seeds of perennial shrubs, annual grasses, and forbs are consumed throughout the year and constitute approximately 5-20% of the San Joaquin antelope squirrel's diet (Hawbecker 1947).

San Joaquin antelope squirrels either dig their own burrows or use burrows created by other species, such as the giant kangaroo rat (*Dipodomys ingens*). San Joaquin antelope squirrels are generally active above ground during spring and summer when air temperatures are between 68°F and 86°F (20°C and 30°C) (California Department of Fish and Game 1992, 1994).

Distribution. Historically, San Joaquin antelope squirrel occurred in the southern and western portions of the San Joaquin Valley and adjacent upland habitats (Williams et al. 1988) and ranged from western Merced County, south to Kern and San Luis Obispo Counties (Figure 5-19). Its range also included portions of the Carrizo and Elkhorn Plains in San Luis Obispo County, Cuyama Valley in San Luis Obispo and Santa Barbara Counties, and Elk Hills in Kern County (Williams et al. 1988).

Currently, the San Joaquin antelope squirrel occupies approximately 20% of its original range (California Department of Fish and Game 1980). Populations now exist primarily in marginal habitats in the low foothills and mountains on the western edge of the San Joaquin Valley. Significant populations exist only at Elk Hills and in portions of the Carrizo and Elkhorn Plains (California Department of Fish and Game 1992, 1994). Small, generally isolated populations are found in the Cuyama Valley, Panoche and Kettleman Hills, and on the floor of the San Joaquin Valley (Williams et al. 1988). Populations of the San Joaquin antelope squirrel are declining (California Department of Fish and Game 1992, 1994).

Endangerment. The San Joaquin antelope ground squirrel population has declined primarily from habitat loss to agriculture (Williams et al. 1988; California Department of Fish and Game 1992, 1994). Approximately 80% of the original geographic range of the species has been converted to agricultural uses (California Department of Fish and Game 1992, 1994). Rodenticides and overgrazing could also be factors contributing to the species' decline (Williams et al. 1988).

Project Area Occurrence. There is one 1918 record of the San Joaquin antelope squirrel 1 mile east of Mendota, about 8 miles northwest of the water transfer pipeline corridors (Natural Diversity Data Base 1997). The Friant-Kern Canal restoration site is outside of the San Joaquin antelope squirrel's range; however, the water transfer pipeline corridors are within the species' range.

Suitable San Joaquin antelope squirrel habitat is limited to alkali habitats along Alternatives 1 and 2 and Option 1A along the pipeline corridors (Figure 4). These alkali habitats are small and isolated from other suitable habitat areas. Although no San Joaquin antelope squirrels were seen during the field survey, they could be present in alkali habitats along Alternatives 1 and 2 and Option 1A in the water transfer pipeline corridors.

Project Impacts. If San Joaquin antelope squirrels are present along Alternatives 1 and 2 and Option 1A in the water transfer pipeline corridors, then they could be adversely

affected by construction activities. Potential construction impacts of the pipeline include damage to or destruction of burrows, direct mortality from construction vehicles or heavy equipment, direct mortality from burrow collapses and subsequent suffocation, temporary disturbance from noise and human presence associated with construction activities, and temporary loss of potential habitat. Because the San Joaquin antelope squirrel is a state listed species, these potential impacts would be considered substantial.

Mitigation. Preconstruction surveys for San Joaquin antelope squirrels should be conducted in and adjacent to alkali habitats along Alternatives 1 and 2 and Option 1A before construction or any earth-moving activities begin. If San Joaquin antelope squirrels are found during the field surveys, the Corps should avoid impacts on this species. If this is not feasible, the Corps would need to consult DFG and USFWS to determine the appropriate mitigation measures, such as relocation of the antelope squirrels and habitat compensation.

Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)

Family: Heteromyidae

Legal Status: The Fresno kangaroo rat is federally and state listed as an endangered species.

Habitat. The Fresno kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides*), the other two subspecies being the Tipton kangaroo rat (*D. n. nitratoides*) and the short-nosed kangaroo rat (*D. n. brevinasus*). The Fresno kangaroo rat is the smallest of the San Joaquin kangaroo rats.

The Fresno kangaroo rat has restrictive habitat requirements. It occupies seasonally flooded or arid alkaline plains with sparse growth of grass and low shrubs (Culbertson 1946). It usually occurs at an elevation of approximately 200 to 300 feet elevation. Historically, Fresno kangaroo rat populations were also found outside of alkaline habitats in the eastern portion of the San Joaquin Valley (Williams pers. comm.). The Fresno kangaroo rat prefers level to gently sloping terrain (California Department of Fish and Game 1992, 1994). The subspecies uses areas with a hummocky land surface for its extensive, shallow burrow systems (Culbertson 1946). The Fresno kangaroo rat is not known to occupy areas that are cultivated or irrigated.

Fresno kangaroo rats primarily eat seeds. They may also consume some green vegetation. Alkali sink vegetation, such as saltbush, iodine bush, saltgrass, and bush seepweed, provides food and cover for the subspecies. Fresno kangaroo rats apparently do not require drinking water.

Distribution. The historical range of the Fresno kangaroo rat probably included

approximately 250,000 acres (101,174 ha) (Hoffman 1974) and extended from north-central Merced County and south through southwestern Madera and central Fresno Counties (Hoffman 1974; Williams 1985; California Department of Fish and Game 1992, 1994). The subspecies was thought to have become extinct only a few years after its discovery in the early twentieth century. However, it was rediscovered near Kerman in Fresno County in 1933 (Culbertson 1934).

Agricultural development has resulted in the extirpation of the Fresno kangaroo rat from most of the San Joaquin Valley. A survey in the late 1970s indicated that the Fresno kangaroo rat actually occupies only 857 acres (346.8 ha) in western Fresno County (Hoffman and Chesemore 1982). A study was undertaken in 1988 to determine the distribution and abundance of the subspecies, but study results are not yet available (California Department of Fish and Game 1992, 1994).

Approximately 6,000 acres (2,428.2 ha) of known Fresno kangaroo rat habitat remain within the species' range. This habitat is mostly fragmented into small, isolated parcels (Hoffman and Chesemore 1982). The USFWS has established critical habitat for the Fresno kangaroo rat near James Road and near Whitesbridge Road in Fresno County (Knapp 1975). An additional 932 acres (377.2 ha) of habitat for this subspecies is protected in the Alkali Sink Ecological Reserve in Fresno County (California Department of Fish and Game 1992, 1994; Chesemore and Rhodehamel 1992). Additional blocks of habitat as large as 800-2,800 acres (323.8-1,133.1 ha) must be preserved to ensure genetic viability for this subspecies. The Fresno kangaroo rat population is in severe decline (California Department of Fish and Game 1992, 1994).

Endangerment. Conversion of native alkali sink and scrub habitats to agricultural uses is the primary cause for the decline of the Fresno kangaroo rat (Hoffman 1974; California Department of Fish and Game 1992, 1994). Intensive livestock grazing may have also significantly reduced habitat suitability for the Fresno kangaroo rat by compacting the soil, damaging burrows, and removing vegetative cover. The use of rodenticides could have accelerated the subspecies' decline (Koos 1977).

Project Area Occurrence. The Fresno kangaroo rat occurs at the Alkali Sink Ecological Reserve operated by DFG. This area is northeast of the Mendota Wildlife Management Area and south of White Bridges Road, several miles northwest of the water transfer pipeline corridors.

The Friant-Kern Canal restoration site is outside of the Fresno kangaroo rat's range; however, the water transfer pipeline corridors is within the species' range.

Suitable Fresno kangaroo habitat is limited to alkali habitats along Alternatives 1 and 2 and Option 1A along the pipeline corridors (Figure 4). Although no kangaroo rats were seen during the field surveys, they could be present in alkali habitats along Alternatives 1 and 2 and

Option 1A in the water transfer pipeline corridors.

Project Impacts. If Fresno kangaroo rats are present along Alternatives 1 and 2 and Option 1A in the water transfer pipeline corridors, then they could be adversely affected by construction activities. Potential construction impacts of the pipeline include damage to or destruction of burrows, direct mortality from construction vehicles or heavy equipment, direct mortality from burrow collapses and subsequent suffocation, temporary disturbance from noise and human presence associated with construction activities, and temporary loss of potential habitat. Because the Fresno kangaroo rat is a state-listed and federally listed species, these potential impacts would be considered substantial.

Mitigation. Preconstruction surveys for Fresno kangaroo rats should be conducted in and adjacent to alkali habitats along Alternatives 1 and 2 and Option 1A before construction or any earth moving activities begin. If Fresno kangaroo rats are found during the field surveys, the Corps should avoid impacts on this species. If this is not feasible, the Corps would need to consult DFG and USFWS to determine the appropriate mitigation measures, such as relocation of the kangaroo rats and habitat compensation.

Western Burrowing Owl (*Athene cunicularia hypugea*)

Family: Strigidae

Legal Status: The western burrowing owl is listed as a state species of special concern and a federal species of concern.

Habitat. Western burrowing owls prefer open, dry, and nearly level grassland habitats where they feed on insects, small mammals, and reptiles (Zeiner et al. 1990). They typically occupy abandoned ground squirrel burrows. The breeding season usually extends from late February to August. Western burrowing owls often nest in roadside embankments, on levees, and along irrigation canals. They are more diurnal than most owls and can often be observed during the day standing outside the entrances to their burrows.

Distribution. Western burrowing owls occur throughout California in valleys, low foothills, and the desert region.

Endangerment. Western burrowing owls were formally common permanent residents throughout much of California, but population declines were noticeable by the 1940s and have continued to the present (Grinnell and Miller 1944, Remsen 1978). Ground squirrel control measures and the conversion of grasslands to agriculture are the primary factors responsible for the species' decline (Zarn 1974). The conversion of agricultural fields and urban vacant lots to urban development also has contributed to their decline.

Project Area Occurrence. There are no records of western burrowing owls in the Friant-Kern Canal restoration site. Western burrowing owls have been recorded along the east bank of the San Luis Drain, approximately 1 mile northwest of the Mendota Wildlife Area headquarters.

Portions of Friant-Kern Canal restoration site, including the grassland areas, are considered potential western burrowing owl habitat; however, no owls have been located at the site during field surveys.

Portions of the water transfer pipeline corridors are considered suitable nesting habitat (Figure 4). Western burrowing owls were observed along Option 1B of Alternative 2 in the water transfer pipeline corridors (Figure 4). These owls could be nesting and wintering in the water transfer pipeline corridors. Other burrowing owls could occur along Alternatives 1 and 2 and Options 1A and 1B in the water transfer pipeline corridors.

Project Impacts. Implementation of the water transfer pipeline corridors could cause mortality of western burrowing owls along Option 1B or other alignments. If western burrowing owls are present in the selected alignment, the owls could be harmed or displaced during construction of the pipeline. If western burrowing owls were harmed or displaced during the breeding season, USFWS would consider these impacts to be a violation of the Migratory Bird Treaty Act (MBTA) and DFG would consider these impacts to be a violation of the California Fish and Game Code. Because the burrowing owl is a state species of special concern and a federal species of concern, this would also be considered a substantial impact on the environment.

Restoration activities at the Friant-Kern Canal restoration site are unlikely to directly impact western burrowing owls. As the area is restored to the riparian forest, the open grassland areas would decrease and eventually the area would become unsuitable for burrowing owls. This impact is considered less than significant because owls are not known to use the site and the conversion of suitable habitat will take many years.

Mitigation. To avoid potential construction impacts on western burrowing owls, if present, the project proponent would comply with the following DFG's burrowing owl mitigation guidelines (California Department of Fish and Game 1995):

- The Corps would retain a qualified biologist to conduct two preconstruction surveys along the alternative alignments during the nesting season (April 15–July 15) to determine whether burrowing owls are present within 500 feet of the construction corridors.

- According to DFG guidelines, no additional mitigation would be needed if burrowing owl dens are at least 160 feet from the pipeline corridors.

- If burrowing owls are present and the owl dens are closer than 160 feet to the alignments, the project proponent would confer with DFG and USFWS to determine the following:

  a. whether the owls would be affected by the construction activity;

  b. what appropriate mitigation measures (e.g., buffer zones), if any, are needed to ensure that the owls are not harmed during construction of the pipeline; and

  c. whether the owls need to be passively relocated from the project site before construction begins. Passive relocation or other mitigation measures should be implemented during the nonbreeding season (September 1-January 31) when eggs or young are not present. The relocation effort would follow DFG's burrowing owl mitigation guidelines (California Department of Fish and Game 1995).

Fisheries

The fisheries evaluation includes hardhead *(Mylopharodon conocephalus)*, Kern brook lamprey (*Lampetra hubbsi*), and California roach (*Lavinia symmetricus*), all species of concern under both the federal and state ESAs (Table 3). USFWS also identified delta smelt (*Hypomesus transpacificus*) as potentially occuring within the project areas; however, delta smelt was not included in the evaluation because it does not occur in the Kings River, nor would it be affected by the projects.

The water transfer pipeline will provide a connection between the Kings River and the Delta via the FID, James Bypass, Fresno Sough, and Mendota Pool. Effects to the Delta smelt due to this new connection are not expectd to be significant.

Hardhead *(Mylopharodon conocephalus)*

Family: Cyprinidae

Legal Status: The hardhead is listed as a federal species of concern and a state species of special concern.

Habitat. Hardhead prefer undisturbed portions of larger streams at low to middle elevations. They are able to withstand summer water temperatures above 20°C; however,

Table 2. Special-Status Wildlife Species that Could Occur or Are Known to Occur in the Friant-Kern Canal Site Restoration or Water Transfer Plan Areas

Common Name / Scientific Name	Status[a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
Vernal pool fairy shrimp *Branchinecta lynchi*	T/--	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County; isolated populations also in Riverside County	Common in vernal pools; also found in sandstone rock outcrop pools	Habitat loss to agricultural and urban development	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Vernal pool tadpole shrimp *Lepidurus packardi*	E/--	Shasta County south to Merced County	Vernal pools and ephemeral stock ponds	Habitat loss to agricultural and urban development	No records; suitable habitat occurs along Alternatives 1 and 2 and Option 1A
Sierra pygmy grasshopper[b] *Tetrix sierrana*	SC/--	Most records from near Lake Tahoe, Placer, and El Dorado Counties	Open areas near creeks; requires damp soils or beach sands	Not known	No records; outside the geographic area for the project
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Streamside habitats below 3,000 feet through the Central Valley of California	Riparian and oak savanna habitats with elderberry shrubs; elderberries are host plant	Loss and fragmentation of riparian habitats	No records; elderberry shrubs present at the Restoration area
San Joaquin dune beetle[b] *Coelus gracilis*	SC/--	Restricted to isolated small sand dunes along the western edge of the San Joaquin Valley; Contra Costa, Fresno, and Kings Counties	Vegetated sand dunes	Not known	No records; outside the geographic area for the project
San Joaquin tiger beetle *Cicindela tranquebarica* ssp.	SC/--	San Joaquin Valley	Alkali wetlands; clay/sandy substrates along creeks, rivers, ponds, and lakes	Loss of habitat	No records; the seasonal wetlands in the alkali habitats along Alternatives 1 and 2 and Option 1A are considered potential habitat
Moestan blister beetle *Lytta moesta*	SC/--	Most records from San Joaquin Valley (Kern, San Joaquin, and Stanislaus Counties); a few specimens collected from Santa Cruz County	Seasonal wetlands; adults are plant feeders	Not known	No records; the seasonal wetlands in the alkali habitats along Alternatives 1 and 2 and Option 1A are considered potential habitat
Ciervo aegialian scarab (beetle)[b] *Aegialia concinna*	SC/--	Western side of San Joaquin Valley; from Antioch to Kettleman Hills	Sand dunes	Not known	No records; outside geographic area for the project
California tiger salamander[b] *Ambystoma californiense* (=*A. tigrinum c.*)	C/SSC	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet; and coastal region from Butte County, south to Santa Barbara County	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy	Loss of grasslands, vernal pools, and other wetlands to agriculture and urbanization	No records; no suitable habitat
Western spadefoot *Scaphiopus hammondii*	SC/SSC	Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California	Shallow streams with riffles and seasonal wetlands, such as vernal pools in annual grasslands and oak woodlands	Alteration of stream habitats by urbanization and hydroelectric projects, and loss of seasonal wetlands and vernal pools	No records; the seasonal wetlands in the alkali habitats along Alternatives 1 and 2 and Option 1A are considered potential habitat
Yosemite toad[b] *Bufo canopus*	--/SC	El Dorado County to Fresno County	Occurs in wet montane meadows and seasonal ponds at elevations between 6,400 and 11,300 feet	Not known	No records; project is outside the geographic range for the species

Table 2. Continued

Common Name Scientific Name	Status [a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
California red-legged frog *Rana aurora draytoni*	T/SSC	Found along the coast and coastal mountain ranges of California from Humboldt County to San Diego County; Sierra Nevada	Permanent and semipermanent aquatic habitats, such as creeks and coldwater ponds, with emergent and submergent vegetation and riparian species along the edges; may estivate in rodent burrows or cracks during dry periods	Alteration of stream and wetland habitats, overharvesting (historically), habitat destruction, competition and predation by fish and bullfrogs	No records; potential habitat exists in the restoration area, although they are usually found in higher elevations in the Sierra Nevada and not usually along major rivers where predatory fish occur
Foothill yellow-legged frog *Rana boylii*	SC/SSC	Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet (1,800 meters) south to Kern County	Creeks or rivers in woodlands or forests with rock and gravel substrate and low overhanging vegetation along the edge; usually found near riffles with rocks and sunny banks nearby	Reduced habitat quality from alteration of stream hydrology, predation by non-native aquatic fauna, loss of habitat from urban development	Several observations of these frogs have occurred along drainages that enter Pine Flat Reservoir; marginal-quality habitat exists at the restoration area
Mountain yellow-legged frog[b] *Rana muscosa*	SC/SSC	Found in the Sierra Nevada from 4,500 feet and above; isolated populations in Butte County; also inhabits southern mountains from Pacoima River, south to Mount Palomar in San Diego, San Bernardino, and Riverside Counties; isolated populations near Mono Lake, Mono County	Associated with stream, lakes, and ponds in montane riparian, lodgepole pine, subalpine conifer, and wet meadow habitats; in southern California restricted to streams in ponderosa pine, montane hardwood-conifer, and montane riparian habitats	Predation by non-native fish and altered streamflows	No records; project is outside the geographic range for the species
Northwestern pond turtle[b] *Clemmys marmorata marmorata*	SC/SSC	In California, range extends from Oregon border of Del Norte and Siskiyou Counties, south along coast to San Francisco Bay, inland through Sacramento Valley, and on the western slope of Sierra Nevada; range overlaps with that of southwestern pond turtle through the Delta and Central Valley to Tulare County	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation	Loss and alteration of aquatic and wetland habitats and habitat fragmentation	No records; suitable habitat at the restoration site only
Southwestern pond turtle *Clemmys marmorata pallida*	SC/SSC	Occurs along the central coast of California east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of the northwestern pond turtle throughout the Delta and in the Central Valley from Sacramento County to Tulare County	Woodlands, grasslands, and open forests; aquatic habitats, such as ponds, marshes, or streams, with rocky or muddy bottoms and vegetation for cover and food	Loss and alteration of aquatic and wetland habitats, habitat fragmentation	Several records of this subspecies in the vicinity of the restoration area, including one at Sycamore Creek on Pine Flat Reservoir
Blunt-nosed leopard lizard *Gambelia (=Crotaphytus) silus*	E/E	San Joaquin Valley from Stanislaus County through Kern County and along the eastern edges of San Luis Obispo and San Benito Counties	Open habitats with scattered low bushes on alkali flats, and low foothills, canyon floors, plains, washes, and arroyos; substrates may range from sandy or gravelly soils to hardpan	Loss of habitat from agriculture and urban development, habitat alteration from overgrazing and rodent eradication	Recorded north of Alternative 2, east of Mendota and along White Bridge Road; suitable alkali habitat exists along Alternatives 1 and 2 and along Option 1A
California horned lizard *Phrynosoma coronatum frontale*	SC/SSC	Sacramento Valley, including foothills, south to southern California; Coast Ranges south of Sonoma County; below 4,000 feet in northern California	Grasslands, brushlands, woodlands, and open coniferous forest with sandy or loose soil; requires abundant ant colonies for foraging	Loss, alteration, and fragmentation of habitat; non-native ants could eliminate its main food (native ants)	No records; marginal-quality habitat exists at the restoration area

Table 2. Continued

Common Name Scientific Name	Status [a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
Silvery legless lizard[b] *Anniella pulchra pulchra*	SC/SSC	Along the Coast, Transverse, and Peninsular Ranges from Contra Costa County to San Diego County with spotty occurrences in the San Joaquin Valley	Habitats with loose soil for burrowing or thick duff or leaf litter; often forages in leaf litter at plant bases; may be found on beaches; sandy washes; and in woodland, chaparral, and riparian areas	Not known	No records; suitable habitat in the restoration site only
San Joaquin whipsnake *Masticophis flagellum ruddocki*	SC/SSC	Central Valley from Colusa County south to Kern County and the inner South Coast Range; very few records east of the San Joaquin River and Fresno Slough	Open, dry scrub and grassland habitats with little or no tree cover	Conversion of valley grassland and shadscale scrub habitats to row crops, vineyards, and orchards; and urban development	The restoration area is probably outside the geographical range of this species and the restoration area has extensive tree cover; the Water Transfer Plan area may be east of the species range; most records of the species are in the western part of the San Joaquin Valley; Alternatives 1 and 2 and Option 1A have potential habitat (alkali habitat), but the habitat units are small and surrounded by agricultural crops (alfalfa and orchards); it is unlikely that this species occurs along the alternative alignments
Giant garter snake[b] *Thamnophis gigas*	T/T	Central Valley from Fresno, north to the Gridley/Sutter Buttes area; has been extirpated from areas south of Fresno	Sloughs, canals, and other small waterways where there is a prey base of small fish and amphibians; requires grassy banks and emergent vegetation for basking and areas of high ground protected from flooding during winter	Loss of habitat from agriculture, urban development, and habitat fragmentation	No records; no suitable habitat
White-faced ibis[b] *Plegadis chihi*	SC/SSC	Both resident and winter populations on the Salton Sea and in isolated areas in Imperial, San Diego, Ventura, and Fresno Counties; breeds at Honey Lake, Lassen County; at Mendota Wildlife Management Area, Fresno County; and near Woodland, Yolo County; winters in Merced County and along the Sacramento River in Colusa, Glenn, Butte, Sutter, and Yolo Counties	Prefers freshwater marshes with tules, cattails, and rushes, but may nest in trees and forage in flooded agricultural fields, especially flooded rice fields	Loss of wetlands to agriculture and urban development	No records; no suitable habitat
Aleutian Canada goose[b] *Branta canadensis leucopareia*	T/--	The entire population winters in Butte Sink, then moves to Los Banos, Modesto, the Delta, and East Bay Reservoirs; stages near Crescent City during spring before migrating to breeding grounds	Roosts in large marshes, flooded fields, stock ponds, and reservoirs; forages in pastures, meadows, and harvested grainfields; corn is especially preferred	Introduction of predators on breeding grounds and loss of traditional wintering habitat	No records; low potential as a winter migrant to Pine Flat Reservoir

Table 2. Continued

Common Name Scientific Name	Status [a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
California condor[b] *Gymnogyps californianus*	E/E	Historically, rugged mountain ranges surrounding the southern San Joaquin Valley; currently, most individuals are in captive populations, but a few birds were recently released in the rugged portions of the Los Padres National Forest	Requires large blocks of open savanna, grasslands, and foothill chaparral with large trees, cliffs, and snags for roosting and nesting	Shooting, habitat loss, lead poisoning, and possibly pesticide contamination	No records; affected area outside the geographic range for the species
Bald eagle *Haliaeetus leucocephalus*	T/E	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced into central coast; winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierras, and east of the Sierra Nevada south of Mono County; range expanding	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, stream, or ocean	Nest sites vulnerable to human disturbance and pesticide contamination	Nearest breeding record is at Eastman Lake, Madera County; probable wintering species at Pine Flat Reservoir
Northern goshawk (North American pop.)[b] *Accipiter gentilis*	SC/SSC	Permanent resident on the Klamath and Cascade Ranges, on the north Coast Ranges from Del Norte County to Mendocino County, and in the Sierra Nevada south to Kern County; winters in Modoc, Lassen, Mono, and northern Inyo Counties; rare in southern California	Nests and roosts in older stands of red fir, Jeffrey pine, and lodgepole pine forests; hunts in forests and in forest clearings and meadows	Loss of nesting habitat and disturbance of nest sites	No records; affected area outside the geographic range for the species
American peregrine falcon[b] *Falco peregrinus anatum*	E/E	Permanent resident on the north and south Coast Ranges; may summer on the Cascade and Klamath Ranges, south through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species	Pesticide contamination; population recovering	No records; no nesting habitat in the affected areas; potential visitor
Prairie falcon *Falco mexicanus*	--/SSC	Found as permanent resident on the south Coast, Transverse, Peninsular, and northern Cascade Ranges, the southeastern deserts, Inyo-White Mountains, Modoc, Lassen, and Plumas Counties, and the foothills surrounding the Central Valley; winters in the Central Valley, along the coast from Santa Barbara County to San Diego County, and in Marin, Sonoma, Humboldt, Del Norte, and Inyo Counties	Cliffs or escarpments for nesting; adjacent dry, open terrain or uplands, marshes, and seasonal marshes for foraging	Possibly pesticide contamination, robbing of eyries by falconers, illegal shooting, and human disturbance at nest site	Nesting habitat from near the Pine Flat Reservoir to the Friant-Kern Canal restoration site; no nesting habitat in the affected areas; potential visitor
Western burrowing owl *Athene cunicularia hypugea*	SC/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along the south coast	Rodent burrows in sparse grassland, desert, and agricultural habitats	Loss of habitat and human disturbance at nesting burrows	Burrowing owls were located along Option 1B; Alternatives 1 and 2 and Options 1A and 1B support potential nesting or wintering habitats; annual grasslands at the restoration area provides potential habitat

Table 2. Continued

Common Name Scientific Name	Status[a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
Mountain plover[b] *Charadrius montanus*	C/SSC	Does not breed in California; in winter, found in the Central Valley south of Yuba County, along the coast in parts of San Luis Obispo, Santa Barbara, Ventura, and San Diego Counties; parts of Imperial, Riverside, Kern, and Los Angeles Counties	Occupies open plains or rolling hills with short grasses or very sparse vegetation; nearby bodies of water are not needed; may use newly plowed or sprouting grainfields	Loss of habitat to agriculture and urban development; decline of California's wintering population may be attributable to disturbance of breeding population	No records; no suitable habitat
California spotted owl *Strix occidentalis occidentalis*	SC/SSC	Sierra Nevada from Lassen County south to northern Kern County; occurs in localized areas of the Transverse and Peninsular Ranges of southern California	Mature forest with permanent water and suitable nesting trees and snags; in southern California, nearly always associated with oak and oak-conifer habitats	Loss of nesting habitat	Known to occur in montane riparian habitat along the upper portion of the Pine Flat Reservoir; highly unlikely that they occur in affected areas
Little willow flycatcher *Empidonax traillii brewsteri*	SC/E	Summer range includes a narrow strip along the eastern Sierra Nevada from Shasta County to Kern County, another strip along the western Sierra Nevada from El Dorado County to Madera County; widespread in migration	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	Loss of riparian breeding habitat and nest parasitism by brown-headed cowbirds	Reported nesting near Shaver Lake, about 14 miles north of the restoration area; marginal-quality nesting habitat is present; unlikely to nest in the restoration area, but it probably occurs there during migration
Tricolored blackbird[b] *Agelaius tricolor*	SC/SSC	Largely endemic to California; permanent residents in the Central Valley from Butte County to Kern County; at scattered coastal locations from Marin County, south to San Diego County; breeds at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields; nesting habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony; requires large foraging areas, including marshes, pastures, agricultural wetlands, dairies, and feedlots, where insect prey is abundant	Loss of wetland and upland breeding habitats from conversion to agriculture and urban development and to water development projects, pesticides contamination, and human disturbance of nesting colonies	No records; potential visitor; no suitable nesting habitat in affected areas
Mount Lyell shrew[b] *Sorex lyelli*	SC/--	Occurs in Yosemite National Park; known from a few locations neat Mount Lyell	Little information is known about habitat requirements; may prefer streamside areas	Not known	No records; affected areas are outside the geographic range for the species
Fringed myotis *Myotis thysanodes*	SC/--	Sierra Nevada, Klamath Mountains, Coast Ranges, and Transverse and Peninsular Ranges	Open woodlands	Not well understood; possibly loss of habitat and disturbance at roost and nesting sites	No records; potential habitat exists at the restoration area
Long-eared myotis *Myotis evotis*	SC/--	Sierra Nevada, Klamath Mountains, Coast Ranges, and Transverse and Peninsular Ranges	Woodlands	Not well understood; possibly loss of habitat and disturbance at roost and nesting sites	No records; potential habitat exists at the restoration area
Small-footed myotis *Myotis ciliolabrum*	SC/--	Sierra Nevada; south Coast, Transverse, and Peninsular Ranges; and the Great Basin	Open stands in forests and woodlands, as well as shrublands; uses caves, crevices, and abandoned buildings for breeding and roosting	Not well understood; possibly loss of habitat and disturbance at roost and nesting sites	No records; potential habitat exists at the restoration area
Long-legged myotis *Myotis volans*	SC/--	Mountains throughout California	Most common in woodlands and forests above 4,000 feet, but occurs from sea level to 11,000 feet	Not well understood; possibly loss of habitat and disturbance at roost and nesting sites	No records; potential habitat exists at the restoration area

Table 2. Continued

Common Name Scientific Name	Status [a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
Yuma myotis *Myotis yumanensis*	SC/--	Considered common and widespread in northern California; colonies known from Marin and San Francisco Counties	Roosts colonially in a variety of natural and human-made sites, including caves, mines, buildings, bridges, and trees; in northern California, maternity colonies are usually in fire-scarred redwoods, pines, or oaks; forages for insects over water bodies	Not well understood; possibly loss of habitat and disturbance at roost and nesting sites	No records; potential habitat exists at the restoration area
Greater western mastiff-bat *Eumops perotis californicus*	SC/SSC	Occurs along the eastern San Joaquin Valley from El Dorado County through Kern County; also found along the south Coast, Peninsular, and Transverse Ranges from San Francisco to the Mexico border	Roosts and breeds in deep, narrow rock crevices; may also use crevices in trees, buildings, and tunnels; forages in a variety of semiarid to arid habitats	Unclear; possibly insecticide contamination and loss of foraging habitat; possibly disturbance to roosting sites	No records; potential habitat exists at the restoration area
Spotted bat *Euderma maculatum*	SC/SSC	Occurs throughout eastern and southern California, the central Sierra Nevada, and the Sierra Nevada foothills bordering the San Joaquin Valley; probably occurs in other portions of the state where habitat is suitable	Roosts primarily in rock crevices; uses arid deserts and open pine forests set in rocky terrain for roosting; females may favor ponderosa pine forests during reproduction	Not well understood; possibly loss of habitat and disturbance at roost and nesting sites	Recorded in the Pine Flat Reservoir Dam area
Pacific Townsend's (=western) big-eared bat *Plecotus townsendii townsendii*	SC/SSC	Coastal regions from Del Norte County south to Santa Barbara County	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings; very sensitive to disturbances and may abandon a roost after an onsite visit	Unclear; possibly human disturbance at roost sites	No records; potential habitat exists at the restoration area
San Joaquin (Nelson's) antelope ground squirrel *Ammospermophilus nelsoni*	SC/T	Western side of the San Joaquin Valley from southern Merced County south to Kern and Tulare Counties; also found on the Carrizo Plain in San Luis Obispo County and the Cuyama Valley in San Luis Obispo and Santa Barbara Counties	Arid grasslands from 200 to 1,200 feet with loamy soils and moderate shrub cover of atriplex and other shrub species	Habitat loss to agricultural development and mineral mining, poisoning from rodenticides	Recorded approximately 4 miles north of the water transfer plan area; suitable habitat exists along Alternatives 1 and 2 and Option 1A
Short-nosed kangaroo rat[b] *Dipodomys nitratoides brevinasus*	SC/SSC	Western side of the San Joaquin Valley from Merced County to Kern County; isolated populations also in San Benito, San Luis Obispo, and Santa Barbara Counties	Arid grassland and desert scrub communities on flat or gently sloping terrain with friable soils	Loss of habitat to development of agricultural	No records; no suitable habitat
Fresno kangaroo rat *Dipodomys nitratoides exilis*	E/E	Found only in Fresno County	Found at elevations from 200 to 300 feet in alkali sink habitats	Habitat loss to agricultural development	No records in the water transfer plan area, but there are records north of the alternative alignments; potential habitat occurs along Alterative 1 and 2 and Option 1A
Tipton kangaroo rat[b] *Dipodomys nitratoides nitratoides*	E/E	Occurs in the Tulare Lake Basin in portions of Fresno, Tulare, and Kern Counties	Found at elevations from 200 to 300 feet in arid grassland and alkali desert scrub communities with sparsely scattered shrubs; soil is usually finely textured and alkaline; may use areas that flood in winter and spring	Loss of habitat to agriculture and poisoning by rodenticides	No records; affected areas are outside the geographic range for the species

Table 2. Continued

Common Name Scientific Name	Status[a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
Giant kangaroo rat[b] *Dipodomys ingens*	E/E	Occurs at high densities in only 12 square miles of habitat along the western side of the San Joaquin Valley, in five separate localities on Elkhorn Plain, Carrizo Plain, McKittrick Valley, and Cuyama Valley in Kern and San Luis Obispo Counties	Restricted to flat, sparsely vegetated areas with native annual grassland and shrubland habitats; requires uncultivated soils consisting of dry, fine, sandy loams for burrowing	Habitat loss to agriculture and poisoning from rodenticides	No records; affected area outside the geographic range for the species
San Joaquin pocket mouse *Perognathus inornatus*	SC/--	Occurs along the eastern side of the San Joaquin Valley	Favors grasslands and oak savannas with friable soils	Not clear	Recorded in the water transfer plan project vicinity, about 1 mile east of Mendota in 1918; potential habitat occurs in the alkali habitats along Alternatives 1 and 2 and Option 1A
San Joaquin Valley woodrat[b] *Neotoma fuscipes riparia*	C/SSC	Known only in Stanislaus and San Joaquin Counties along the San Joaquin, Stanislaus, and Tuolumne Rivers; Caswell State Park, San Joaquin County	Riparian habitats where trees and brush are available for cover and nesting	Loss of riparian habitat; limited range	No records; affected area outside the geographic range for the species
Tulare grasshopper mouse[b] *Onychomys torridus tularensis*	SC/SSC	Madera, Kings, Kern, and eastern San Luis Obispo Counties	Grasslands, chaparral, sagebrush, bitterbrush scrub, and alkali desert scrub	Not known	No records; no suitable habitat
Southern grasshopper mouse[b] *Onychomys torridus ramona*	SC/SSC	Southwestern San Bernardino, northern Los Angeles, western Riverside, and San Diego Counties	Grassland and chaparral habitats	Not known	No records; affected area outside the geographic range for the species
San Joaquin kit fox *Vulpes macrotis mutica*	E/T	Principally occurs in the San Joaquin Valley and adjacent open foothills to the west; recent records from 17 counties extending from Kern County north to Contra Costa County	Saltbush scrub, grassland, oak, savanna, and freshwater scrub	Habitat loss to agricultural development; altered habitat from grazing, mining, and industrial development; predation by dogs and non-native red foxes	Recorded near Jameson, north of the Water Transfer Plan area; potential habitat occurs along Alternatives 1 and 2 and Option 1A
Sierra Nevada red fox[b] *Vulpes vulpes necator*	SC/T	Cascade Range east to the Sierra Nevada then south to Tulare County	Red fir and lodgepole pine forests, generally from 5,000 to 8,400 feet, associated with mountain meadows	Reason for decline unclear; altered habitat from logging, grazing, and recreational activities	No records; affected area outside the geographic range for the species
Pacific fisher[b] *Martes pennanti pacifica*	SC/SSC	Coastal mountains from Del Norte County to Sonoma County, through Cascades to Lassen County; south in the Sierra Nevada to Kern County	Mixed conifer habitats with high overstory cover; preference for riparian areas and other ecotonal habitats	Altered habitat from logging; historic trapping	No records; affected area outside the geographic range for the species
California wolverine[b] *Gulo gulo luteus*	SC/T	Klamath and Cascade Ranges, south through the Sierra Nevada to Tulare County	Sighted in a variety of habitats from 1,600 to 14,200 feet; most common in open terrain above timberline and subalpine forests	Reason for decline unclear; altered habitat from logging and recreation activities	No records; affected area outside the geographic range for the species
California bighorn sheep[b] *Ovis canadensis californiana*	SC/T	Southern Sierra Mountains at Mount Baxter and Mount Williamson	Dwarf shrub, sagebrush, desert scrub, pinyon juniper, and montane riparian	Competition with livestock and diseases transmitted by livestock has attributed to elimination and reduction of some populations	No records; affected area outside the geographic range for the species

Table 2. Continued

- Status explanations (see the "Definitions of Special-Status Species" section above for citations):

Federal

E = listed as endangered under the federal Endangered Species Act.

T = listed as threatened under the federal Endangered Species Act.

C = species for which USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded.

SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.

-- = no listing.

State

E = listed as endangered under the California Endangered Species Act.

T = listed as threatened under the California Endangered Species Act.

SSC = species of special concern in California.

-- = no listing.

- Species that occur on the USFWS list that were not evaluated in the report because they do not occur within the geographic area of the project or no suitable habitat was present within the project area to support the species.

hardhead will select lower temperatures when available. They are fairly intolerant of low oxygenated waters, particularly at higher water temperatures. Pools with sand-gravel substrates and slow water velocities are the preferred habitat. Adult fish inhabit the lower half of the water column, while the juvenile fish remain in the shallow water closer to the stream edges. Hardhead typically feed on small invertebrates and aquatic plants at the bottom of quiet water.

Hardhead are always found in association with Sacramento squawfish and Sacramento suckers (*Catostomus occidentalis*). They tend to be absent from systems with a predominance of introduced fish, particularly centrarchids, or streams that have been severely altered by human activities.

Distribution. Hardhead are widely distributed throughout the low- to mid-elevation streams in the main Sacramento-San Joaquin River drainage and in the Russian River drainage. The range extends from the Pitt River to the Kern River. In the San Joaquin River drainage, populations are scattered in the tributary streams but are absent from the valley reaches of the San Joaquin River. Hardhead occur in Pine Flat Reservoir (Moyle 1976) and in the Kings River, above and below the reservoir (Halstead, pers. comm., Stephen, pers. comm.)

Endangerment. Hardhead inhabit waters that are being altered by impoundments and water diversions, which eliminate or fragment habitat and result in temperature and flow regimes that are unsuitable. Predation by smallmouth bass (*Micropterus punctulatus*) caused the reduction in abundance of hardhead from the upper Kings River (Brown and Moyle 1993). Hardhead do not survive well in reservoirs colonized by introduced species, especially centrarchids.

Project Occurrence. Hardhead occur throughout the lower Kings River below Pine Flat Dam.

Project Impacts. Hardhead would not be negatively affected by the multilevel intake structure design. The multilevel intake structure would result in warmer surface waters being released from the reservoir in early summer when temperatures are still cool. Later in summer, releases from the lower elevation intakes would release cooler water. Hardhead do utilize warmer waters, and optimal temperatures are between 24°C and 28°C. Water temperatures in the river below the dam currently range between 20°C and 25°C in July and August, within the optimal range for hardhead. Temperatures above optimal can lead to stress for hardhead, resulting in changes in growth rate and metabolism, susceptibility to disease, frequency of deformity, and mortality. The water release program, however, should maintain temperatures well within the optimal range for hardhead.

Removing water from the Kings River farther downstream than the existing diversion location will increase flows in the river, thus increasing the amount of habitat available to hardhead, including pools, backwater areas, and other habitat types. Increased flows also could

result in a steadier water temperature regime (i.e., less prone to warming during low-flow months).

Mitigation. No mitigation is required.

Kern Brook Lamprey (*Lampetra hubbsi*)

Family: Petromyzontidae

Legal Status: The Kern brook lamprey is listed as a federal species of concern and a state species of special concern.

Habitat. Kern brook lamprey typically inhabit backwaters of large rivers in foothill regions (elevations between 30 and 327 m). Ammocoetes are often found in the shallow pools along the edges of run habitats with slight flow and temperatures rarely over 25°C. Sand, gravel, and small cobble are the common substrates occupied by adults. The ammocoetes prefer sand and mud substrates so they can bury themselves with their heads exposed to feed.

Distribution. Kern brook lamprey inhabit the Friant-Kern Canal and lower reaches of the Merced, Kaweah, Kings, and San Joaquin Rivers. They also inhabit the Kings River above Pine Flat Reservoir.

Endangerment. Fragmentation and isolation of populations of Kern brook lamprey increases the potential for localized extirpation. The regulation of river flows often counter the needs of the fish. Ammocoetes buried in shallow waters could become exposed and desiccate. Channelization of rivers reduces the number of backwater areas required by the ammocoetes, and could reduce or compact the gravels used for spawning.

Project Occurrence. Kern brook lamprey occur in the lower Kings River and in the Friant-Kern Canal; however, they are not likely to reproduce because of the lack of suitable habitat.

Project Impacts. Kern brook lamprey will not be negatively affected by the multilevel intake structure design on the Kings River. The multilevel intake structure would result in warmer surface waters being released from the reservoir in early summer when temperatures are still cool. Later in the summer, releases from the lower elevation intakes would release cooler water. Kern brook lamprey prefer water temperatures that rarely exceed 25°C. Water temperatures in the river below the dam currently range between 20°C and 25°C in July and August, within the optimal range for Kern brook lamprey. This release program, however, would allow more flexibility in mixing water temperatures and should maintain temperatures well within the optimal range for Kern brook lamprey. The above release program is the Corps

objective. Modeling would determine whether this goal will be achieved.

Riparian vegetation has been removed from much of the Kings River area. The restoration of riparian habitat along the Kings River at the Friant-Kern Canal restoration site would increase complexity of the river, thus improving habitat conditions for the Kern brook lamprey, reducing bank erosion and decreasing sedimentation, and regulation of water temperatures.

During low flow periods, increase flows in the river will increase the amount of habitat available to Kern brook lamprey, and assist in the stabilization of water temperatures during the low-flow periods. Although Kern brook lamprey are found in the Friant-Kern Canal, there is not likely to be any suitable spawning habitat and the individuals present in the canal are not contributing to the continuation of the species.

Mitigation. No mitigation is required.

California Roach (*Lavinia symmetricus*)

Family: Cyprinidae

Legal Status: The California roach is listed as a federal species of concern and a state species of special concern.

Habitat. California roach occupy small, warm streams with intermittent flow in mid-elevation foothills. Dense populations often occur in isolated pools. They are tolerant of high temperatures (30-35°C) and low oxygen levels, although they can also be found in cold, well-oxygenated systems; human-modified habitats; and the main channels of larger rivers.

Distribution. California roach are distributed throughout the state; however, the unnamed subspecies found in the San Joaquin River drainage are found in tributaries from the Cosumnes River south. California roach inhabit the lower Kings River (Stephens, pers. comm.)

Endangerment. Fragmentation and isolation as a result of diversions, dams, and artificial barriers have affected the population in the San Joaquin system. Development and grazing pressure on private lands have changed habitats. Many streams have dried up more frequently than normal or completely as a result of diversions from the aquifers that feed the streams. Predation primarily by introduced centrarchid species often eliminates California roach.

Project Occurrence. California roach occur in the Kings River below the Pine Flat Dam and could occur in the Friant-Kern Canal.

Project Impacts. California roach will not be affected by the multilevel intake structure design on the Kings River. California roach can inhabit waters with temperatures above 30°C and low oxygen levels, although they are frequently found in water temperatures well below 30°C. Water temperatures in the river below the dam currently range between 20°C and 25°C in July and August, within the suitable range for California roach. The change in release patterns will lower the water temperatures during the summer months.

The restoration of riparian habitat along the Kings River could increase complexity of the river, thus improving habitat conditions for the California roach, by creating pools and reducing bank erosion and decreasing sedimentation.

Removing water from the Kings River farther downstream than the existing diversion location will increase flows in the river, thus increasing the amount of habitat available to California roach and stabilizing the water temperatures.

Mitigation. No mitigation is required.

SUMMARY

A total of 15 special-status plants were evaluated in detail in this BDR. These special-status plants included four species that are federally or state listed as threatened or endangered; one species proposed for federal listing as threatened; and nine species classified by the CNPS as rare, endangered, or with limited distribution. No critical habitat for any of the federally listed species was identified within the project area.

A total of 11 special-status wildlife species and three special-status fish species were evaluated in detail in this BDR. Ten of these special-status wildlife species are federally or state listed as threatened or endangered. One wildlife species and the three fish species are designated California species of special concern. No critical habitat for any of the federally listed species evaluated was identified within the project area.

Restoration activities at the Friant-Kern Canal restoration site would have a beneficial impact on common and special-status species by increasing the abundance of valley oak woodland and riparian forest in the region. In California, the riparian forest habitat is one of richest in terms of species diversity and has been greatly reduced by development and agriculture.

Construction activities along the proposed 6-mile water transfer pipeline could affect special-status plant and wildlife species. Focused surveys for special-status species before construction begins along the pipeline routes, particularly in the alkali habitat identified adjacent to the alignments, would provide information for developing mitigation measures to avoid or

Table. 3. Special-Status Fish Species that Could Occur or Are Known to Occur in the Kings River Watershed

Common and Scientific Name	Status[a] Federal/State	California Distribution	Habitats	Reason for Decline or Concern	Occurrence in Study Area
Hardhead *Mylopharodon conocephalus*	SC/SSC	Sacramento to San Joaquin River drainage; Pit River to Kern River	Streams in low to mid elevations; sand-gravel substrate and low-water velocity	Alteration of habitat from impoundments and water diversions	Occur throughout the Kings River
Kern brook lamprey *Lampetra hubbsi*	SC/SSC	Merced, Kaweah, Kings and San Joaquin Rivers	Backwaters of large foothill rivers; small substrate preferred	Alteration of habitat from regulated flows and channelization	Occur throughout the Kings River
California roach[b] *Lavinia symmetricus*	SC/SSC	San Joaquin River tributaries from Cosumnes River south	Small warm streams in mid-elevation foothills	Fragmentation from impoundments, diversions, and artifical barriers; predation	Occur in the Kings River below Pine Flat Dam
Delta smelt[c] *Hypomesus transpacificus*	T/T	Sacramento to San Joaquin Delta; lower sections of the Sacramento and San Joaquin Rivers	Brackish water; spawn at 2 parts per thousand (ppt) salinity	Alteration of habitat from water diversion and reduced water quality	Does not occur in the Kings River

[a] Status explanations (see the "Definitions of Special-Status Species" section above for citations):

Federal

T = listed as threatened under the federal Endangered Species Act.

SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.

State

T = listed as threatened under the California Endangered Species Act.

SSC = species of special concern in California.

[b] California Roach consists of several subspecies. This table indicates the requirements and locations of the San Joaquin subspecies.

[c] Species that occur on the USFWS list that were not evaluated in the report because it does not occur in the Kings River and it would not be affected by the project.

compensate for potential impacts on identified species.

The water transfer pipeline and multilevel water intake structure would have a beneficial affect on native special-status fish species by providing cool water temperatures and increased water flows during late summer and fall.

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Appendix A. U.S. Fish and Wildlife Service Special-Status Species List

FACSIMILE HEADER SHEET

US Army Corps of Engineers
Sacramento District

US Army Engineer District, Sacramento
1325 J Street
Sacramento, California 95814-2922

January 6, 1998
(Date)

TO: Steve Avery	Fax Phone: 737-3030 Voice Phone: 737-3000
FROM: Patricia Robertson	Fax Phone: 557-7856 Voice Phone: 557-6705

Number of pages to follow: 18

(Releaser's Signature)

COMMENTS:

Steve,

Attached is the latest species list we received for Pine Flat. Our letter to the Service included the pipeline location so the species list should be inclusive.

Patricia

SPK FORM 63
1 JAN 92

(Edition of 1 Jan 91 may be used)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
3310 El Camino Avenue, Suite 130
Sacramento, California 95821-6340

IN REPLY REFER TO:
1-1-97-SP-1381

August 4, 1997

Department of the Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Subject: Species Lists for Proposed Pine Flat Dam, East of Fresno

Dear Ms. Roberson:

The enclosed lists are in reply to your letter of May 14, 1997, requesting information about the endangered and threatened species that may be present in your project area (see Enclosure A). Information concerning the life history, distribution, and habitat requirements for the listed species is available upon request.

The Service used the information in your letter to locate the proposed project on a U.S. Geological Survey (USGS) 7.5 minute quadrangle map. The animal species on the Enclosure A quad lists are those species we believe may occur within, *or be affected by projects within*, the 376B, 376C, 377A and 377D QUADS, where your project is planned.

Any plants on the Enclosure A quad list[s] are those *that have actually been observed* in the project quad[s]. Plants on the county list[s] may also occur in the quad[s] where your project is located.

Some of the species listed in Enclosure A may not be affected by the proposed action. A trained biologist or botanist, familiar with the habitat requirements of the listed species, should determine whether these species or habitats suitable for these species may be affected by the proposed action. For plant surveys, the Service recommends using the enclosed Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Species (Enclosure B).

Ms. Patricia Roberson

Information and maps concerning candidate species in California are available from the California Natural Diversity Data Base, a program of the California Department of Fish and Game. Address your request to: Marketing Manager, California Department of Fish and Game, Natural Diversity Data Base, 1416 Ninth Street, Sacramento, California 95814 (916) 322-2493.

All listed species identified in Enclosure A are fully protected under the mandates of the Endangered Species Act of 1973, as amended (Act). Section 9 of the Act and its implementing regulations prohibit the "take" of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such wildlife species. Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures. If a Federal agency is involved with the permitting, funding, or carrying out of this project, then initiation of formal consultation between that agency and the Service pursuant to section 7 of the Act is required if it is determined that the proposed project may affect a federally listed species. Such consultation would result in a biological opinion that addresses anticipated effects of the project to listed and proposed species and may authorize a limited level of incidental take. If a Federal agency is not involved with the project, and federally listed species may be taken as part of the project, then an "incidental take" permit pursuant to section 10(a) of the Act should be obtained. The Service may issue such a permit upon completion by the permit applicant of a satisfactory conservation plan for the listed species that would be affected by the project.

If suitable habitat for federally listed species exists in the project area, we recommend that surveys for them be undertaken by qualified biologists during or prior to the environmental review process. We also recommend that surveys be undertaken for the proposed and candidate species included in Enclosure A if suitable habitat exists on site. The results of these surveys should be published in any environmental documents prepared for this project.

Should these surveys determine that federally listed or proposed species occur in the area and are likely to be affected by the proposed project, the Service recommends that the project proponent, in consultation with this office and the California Department of Fish and Game, develop a plan that mitigates for the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. The mitigation plan also should be included in the environmental document.

We also recommend addressing adverse impacts to candidate species. One of the benefits of considering these species early in the planning process is that by exploring alternatives, it may be possible to avoid conflicts that could develop, should a candidate species become listed before the project is complete.

Ms. Patricia Roberson

In the Federal Register of February 28, 1996, the Service changed its policy on candidate species. The term *candidate* now strictly refers to species for which the Service has on file enough information to propose listing as endangered or threatened. Former *category 2* candidate species - species for which listing is possibly appropriate but for which the Service lacks sufficient information to support a listing proposal - are now called *species of concern*. They are no longer monitored by the Service. However we have retained them on the enclosed list for general information. We encourage consideration of them in project planning, as they may become candidate species in the future.

If the proposed project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by the U.S. Army Corps of Engineers (Corps), a Corps permit will be required, pursuant to section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 979-2113.

We appreciate your concern for endangered species. If you have further questions, please call Peter Cross of this office at (916) 979-2725. For the fastest response to species list requests, address them to the attention of the section 7 office assistant at this address.

Sincerely,

Patrick Leonard

for Wayne S. White
Field Supervisor

Enclosures

ENCLOSURE A

Endangered and Threatened Species that May Occur in or be Affected by Projects in the Following Selected Quads

Reference File No. 1381

August 3, 1997

QUAD : 376B SACATE RIDGE

Listed Species

Birds

American peregrine falcon, *Falco peregrinus anatum* (E)

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Species of Concern

Mammals

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Sierra Nevada red fox, *Vulpes vulpes necator* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (SC)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

QUAD : 376B SACATE RIDGE

Species of Concern

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

QUAD : 376C LUCKETT MTN.

Listed Species

Birds

American peregrine falcon, *Falco peregrinus anatum* (E)

California condor, *Gymnogyps californianus* (E)

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Species of Concern

Mammals

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

QUAD : 376C LUCKETT MTN.

Species of Concern

Mammals

Pacific western big-eared bat, *Plecotus townsendii townsendii* (SC)

Sierra Nevada red fox, *Vulpes vulpes necator* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (SC)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

QUAD : 377A TRIMMER

Listed Species

Birds

American peregrine falcon, *Falco peregrinus anatum* (E)

bald eagle, *Haliaeetus leucocephalus* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

QUAD : 377A TRIMMER

Listed Species

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Proposed Species

Plants

carpenteria, *Carpenteria californica* (PT)

Species of Concern

Mammals

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Pacific western big-eared bat, *Plecotus townsendii townsendii* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (SC)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

QUAD : 377A TRIMMER

Species of Concern

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

Dry Creek cliff strider bug, *Oravelia pege* (SC)

Plants

orange lupine, *Lupinus citrinus var. citrinus* (SC)

QUAD : 377D PINE FLAT DAM

Listed Species

Birds

American peregrine falcon, *Falco peregrinus anatum* (E)

bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

blunt-nosed leopard lizard, *Gambelia (=Crotaphytus) silus* (E)

giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)

Invertebrates

valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

QUAD : 377D PINE FLAT DAM

Species of Concern

Mammals

spotted bat, *Euderma maculatum* (SC)

greater western mastiff-bat, *Eumops perotis californicus* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Pacific western big-eared bat, *Plecotus townsendii townsendii* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (SC)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

foothill yellow-legged frog, *Rana boylii* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

Kern brook lamprey, *Lampetra hubbsi* (SC)

Invertebrates

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

molestan blister beetle, *Lytta molesta* (SC)

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	May be endangered or threatened. Not enough biological information has been gathered to support listing at this time.
(*)		Possibly extinct.
	Critical Habitat	Area essential to the conservation of a species.

ENCLOSURE A

Endangered and Threatened Species that May Occur in or be Affected by
Projects in the Area of the Following California County or Counties
Reference File No. 1381

July 31, 1997

FRESNO COUNTY

Listed Species

Mammals

giant kangaroo rat, *Dipodomys ingens* (E)
Fresno kangaroo rat, *Dipodomys nitratoides exilis* (E)
Fresno kangaroo rat critical habitat, *Dipodomys nitratoides exilis* (E)
Tipton kangaroo rat, *Dipodomys nitratoides nitratoides* (E)
San Joaquin kit fox, *Vulpes macrotis mutica* (E)

Birds

American peregrine falcon, *Falco peregrinus anatum* (E)
California condor, *Gymnogyps californianus* (E)
Aleutian Canada goose, *Branta canadensis leucopareia* (T)
bald eagle, *Haliaeetus leucocephalus* (T)

Reptiles

blunt-nosed leopard lizard, *Gambelia (=Crotaphytus) silus* (E)
giant garter snake, *Thamnophis gigas* (T)

Amphibians

California red-legged frog, *Rana aurora draytonii* (T)

Fish

delta smelt, *Hypomesus transpacificus* (T)
Paiute cutthroat trout, *Oncorhynchus (=Salmo) clarki seleniris* (T)

Invertebrates

vernal pool fairy shrimp, *Branchinecta lynchi* (T)
valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (T)

Plants

California jewelflower, *Caulanthus californicus* (E)
palmate-bracted bird's-beak, *Cordylanthus palmatus* (E)
San Joaquin wooly-threads, *Lembertia congdonii* (E)
Hartweg's golden sunburst, *Pseudobahia bahiifolia* (E)

FRESNO COUNTY

Listed Species

Plants

San Joaquin adobe sunburst, *Pseudobahia peirsonii* (E)
San Benito evening-primrose, *Camissonia benitensis* (T)
fleshy owl's-clover, *Castilleja campestris ssp. succulenta* (T)
Hoover's wooly-star, *Eriastrum hooveri* (T)
San Joaquin Valley Orcutt grass, *Orcuttia inaequalis* (T)
Greene's tuctoria, *Tuctoria greenei* (E)

Proposed Species

Fish

Central Valley steelhead, *Oncorhynchus mykiss* (PE)
Sacramento splittail, *Pogonichthys macrolepidotus* (PT)

Plants

Mariposa pussy-paws, *Calyptridium pulchellum* (PE)
carpenteria, *Carpenteria californica* (PT)

Candidate Species

Mammals

San Joaquin Valley woodrat, *Neotoma fuscipes riparia* (C)

Birds

mountain plover, *Charadrius montanus* (C)

Amphibians

California tiger salamander, *Ambystoma californiense* (C)

Species of Concern

Mammals

Nelson's antelope ground squirrel, *Ammospermophilus nelsoni* (SC)
short-nosed kangaroo rat, *Dipodomys nitratoides brevinasus* (SC)
spotted bat, *Euderma maculatum* (SC)
greater western mastiff-bat, *Eumops perotis californicus* (SC)
California wolverine, *Gulo gulo luteus* (SC)

FRESNO COUNTY

Species of Concern

Mammals

Pacific fisher, *Martes pennanti pacifica* (SC)

small-footed myotis bat, *Myotis ciliolabrum* (SC)

long-eared myotis bat, *Myotis evotis* (SC)

fringed myotis bat, *Myotis thysanodes* (SC)

long-legged myotis bat, *Myotis volans* (SC)

Yuma myotis bat, *Myotis yumanensis* (SC)

Southern grasshopper mouse, *Onychomys torridus ramona* (SC)

Tulare grasshopper mouse, *Onychomys torridus tularensis* (SC)

California bighorn sheep, *Ovis canadensis californiana* (SC)

San Joaquin pocket mouse, *Perognathus inornatus* (SC)

pale Townsend's big-eared bat, *Plecotus townsendii pallescens* (SC)

Pacific western big-eared bat, *Plecotus townsendii townsendii* (SC)

Mt. Lyell shrew, *Sorex lyellii* (SC)

Sierra Nevada red fox, *Vulpes vulpes necator* (SC)

Birds

northern goshawk, *Accipiter gentilis* (SC)

tricolored blackbird, *Agelaius tricolor* (SC)

western burrowing owl, *Athene cunicularia hypugea* (SC)

ferruginous hawk, *Buteo regalis* (SC)

little willow flycatcher, *Empidonax traillii brewsteri* (SC)

white-faced ibis, *Plegadis chihi* (SC)

California spotted owl, *Strix occidentalis occidentalis* (SC)

Reptiles

silvery legless lizard, *Anniella pulchra pulchra* (SC)

northwestern pond turtle, *Clemmys marmorata marmorata* (SC)

southwestern pond turtle, *Clemmys marmorata pallida* (SC)

San Joaquin whipsnake, *Masticophis flagellum ruddocki* (SC)

California horned lizard, *Phrynosoma coronatum frontale* (SC)

Amphibians

Yosemite toad, *Bufo canorus* (SC)

Mount Lyell salamander, *Hydromantes platycephalus* (SC)

foothill yellow-legged frog, *Rana boylii* (SC)

FRESNO COUNTY

Species of Concern

Amphibians

mountain yellow-legged frog, *Rana muscosa* (SC)

western spadefoot toad, *Scaphiopus hammondii* (SC)

Fish

green sturgeon, *Acipenser medirostris* (SC)

river lamprey, *Lampetra ayresi* (SC)

Kern brook lamprey, *Lampetra hubbsi* (SC)

Pacific lamprey, *Lampetra tridentata* (SC)

longfin smelt, *Spirinchus thaleichthys* (SC)

Invertebrates

Ciervo aegialian scarab beetle, *Aegialia concinna* (SC)

San Joaquin tiger beetle, *Cicindela tranquebarica ssp* (SC)

San Joaquin dune beetle, *Coelus gracilis* (SC)

Kings Canyon cryptochian caddisfly, *Cryptochia excella* (SC)

Wooly hydroporus diving beetle, *Hydroporus diving beetle* (SC)

Hopping's blister beetle, *Lytta hoppingi* (SC)

moestan blister beetle, *Lytta moesta* (SC)

molestan blister beetle, *Lytta molesta* (SC)

Morrison's blister beetle, *Lytta morrisoni* (SC)

Dry Creek cliff strider bug, *Oravelia pege* (SC)

Bohart's blue butterfly, *Philotiella speciosa bohartorum* (SC)

Sierra pygmy grasshopper, *Tetrix sierrana* (SC)

Plants

obovate-leaved thornmint, *Acanthomintha obovata ssp. obovata* (SC)

forked fiddleneck, *Amsinckia vernicosa var. furcata* (SC)

Bodie Hills rock-cress, *Arabis bodiensis* (SC)

Raven's milk-vetch, *Astragalus monoensis var. ravenii* (SC)

heartscale, *Atriplex cordulata* (SC)

brittlescale, *Atriplex depressa* (SC)

Lost Hills saltbush, *Atriplex vallicola* (SC)

South Coast Range morning-glory, *Calystegia collina ssp. venusta* (SC)

Mono Hot Springs evening-primrose, *Camissonia sierrae ssp. alticola* (SC)

San Benito spineflower, *Chorizanthe biloba var. immemora* (SC)

FRESNO COUNTY

Species of Concern

Plants

- Fresno County bird's-beak, *Cordylanthus tenuis ssp. barbatus* (SC)
- recurved larkspur, *Delphinium recurvatum* (SC)
- mouse buckwheat, *Eriogonum nudum var. murinum* (SC)
- spiny-sepaled coyote-thistle, *Eryngium spinosepalum*. (SC)
- hollisteria, *Hollisteria lanata* (SC)
- delta tule-pea, *Lathyrus jepsonii var. jepsonii* (SC)
- rayless layia, *Layia discoidea* (SC)
- Panoche peppergrass, *Lepidium jaredii var. album* (SC)
- long-petaled lewisia, *Lewisia longipetala* (SC)
- orange lupine, *Lupinus citrinus var. citrinus* (SC)
- valley sagittaria, *Sagittaria sanfordii* (SC)
- parasol clover, *Trifolium bolanderi* (SC)
- lesser saltscale, *Atriplex minuscula* (SC)
- pale-yellow layia, *Layia heterotricha* (SC)

KEY:

(E)	*Endangered*	Listed (in the Federal Register) as being in danger of extinction.
(T)	*Threatened*	Listed as likely to become endangered within the foreseeable future.
(P)	*Proposed*	Officially proposed (in the Federal Register) for listing as endangered or threatened.
(C)	*Candidate*	Candidate to become a *proposed* species.
(SC)	*Species of Concern*	May be endangered or threatened. Not enough biological information has been gathered to support listing at this time.
(*)	Possibly extinct.	
	Critical Habitat	Area essential to the conservation of a species.

Enclosure B

GUIDELINES FOR CONDUCTING AND REPORTING BOTANICAL INVENTORIES FOR FEDERALLY LISTED, PROPOSED AND CANDIDATE PLANTS

(September 23, 1996)

These guidelines describe protocols for conducting botanical inventories for federally listed, proposed and candidate plants, and describe minimum standards for reporting results. The Service will use, in part, the information outlined below in determining whether the project under consideration may affect any listed, proposed or candidate plants, and in determining the direct, indirect, and cumulative effects.

Field inventories should be conducted in a manner that will locate listed, proposed, or candidate species (target species) that may be present. The entire project area requires a botanical inventory, except developed agricultural lands. The field investigator(s) should:

1. Conduct inventories at the appropriate times of year when target species are present and identifiable. Inventories will include all potential habitats. Multiple site visits during a field season may be necessary to make observations during the appropriate phenological stage of all target species.

2. If available, use a regional or local reference population to obtain a visual image of the target species and associated habitat(s). If access to reference populations(s) is not available, investigators should study specimens from local herbaria.

3. List every species observed and compile a comprehensive list of vascular plants for the entire project site. Vascular plants need to be identified to a taxonomic level which allows rarity to be determined.

4. Report results of botanical field inventories that include:

    a. a description of the biological setting, including plant community, topography, soils, potential habitat of target species, and an evaluation of environmental conditions, such as timing or quantity of rainfall, which may influence the performance and expression of target species

    b. a map of project location showing scale, orientation, project boundaries, parcel size, and map quadrangle name

    c. survey dates and survey methodology(ies)

d. if a reference population is available, provide a written narrative describing the target species reference population(s) used, and date(s) when observations were made

e. a comprehensive list of all vascular plants occurring on the project site for each habitat type

f. current and historic land uses of the habitat(s) and degree of site alteration

g. presence of target species off-site on adjacent parcels, if known

h. an assessment of the biological significance or ecological quality of the project site in a local and regional context

5. If target species is(are) found, report results that additionally include:

   a. a map showing federally listed, proposed and candidate species distribution as they relate to the proposed project

   b. if target species is (are) associated with wetlands, a description of the direction and integrity of flow of surface hydrology. If target species is (are) affected by adjacent off-site hydrological influences, describe these factors.

   c. the target species phenology and microhabitat, an estimate of the number of individuals of each target species per unit area; identify areas of high, medium and low density of target species over the project site, and provide acres of occupied habitat of target species. Investigators could provide color slides, photos or color copies of photos of target species or representative habitats to support information or descriptions contained in reports.

   d. the degree of impact(s), if any, of the proposed project as it relates to the potential unoccupied habitat of target habitat.

6. Document findings of target species by completing California Native Species Field Survey Form(s) and submit form(s) to the Natural Diversity Data Base. Documentation of determinations and/or voucher specimens may be useful in cases of taxonomic ambiguities, habitat or range extensions.

7. Report as an addendum to the original survey, any change in abundance and distribution of target plants in subsequent years. Project sites with inventories older than 3 years from the current date of project proposal submission will likely need additional survey. Investigators need to assess whether an additional survey(s) is (are) needed.

8. Adverse conditions may prevent investigator(s) from determining presence or identifying some target species in potential habitat(s) of target species. Disease, drought, predation, or herbivory may preclude the presence or identification of target species in any year. An additional botanical inventory(ies) in a subsequent year(s) may be required if adverse conditions occur in a potential habitat(s). Investigator(s) may need to discuss such conditions.

9. Guidance from California Department of Fish and Game (CDFG) regarding plant and plant community surveys can be found in Guidelines for Assessing the Effects of Proposed Developments on Rare and Endangered Plants and Plant Communities, 1984. Please contact the CDFG Regional Office for questions regarding the CDFG guidelines and for assistance in determining any applicable State regulatory requirements.

KRCD

Kings River Conservation District
4886 E. Jensen Avenue • Fresno, California 93725-1899
Telephone: (559) 237-5567 • Fax: (559) 237-5560

File: 527.03.02

October 18, 2001

Mr. Dave Tedrick
U.S. Army Corps of Engineers
Sacramento District, CESPK-PF-R
1325 J Street
Sacramento, CA 95814

RE: **Pine Flat Dam Fish and Wildlife Habitat Restoration, Fresno, California**
Byrd Slough Habitat Restoration Site on the Kings River
Surveys for San Joaquin Kit Fox and California Red-legged Frog

Dear Dave:

As requested by the U.S. Fish and Wildlife Service (USFWS) in early October 2001, we conducted surveys for the San Joaquin Kit Fox and California Red-legged Frog on the Byrd Slough Habitat Restoration Site. The restoration project is an improvement project for riparian and oak woodland habitats and wildlife. The project involves a 143 acre site, repairing perimeter fences, excluding cattle from the site, planting riparian and valley oak trees and shrubs in grassland habitat, installing an irrigation system to water the vegetation, installing a revegetation sign, installing wildlife structures such as brush piles, nesting boxes, and bird perches, and maintenance and monitoring for 3 years. Below are the results of our kit fox and red-legged frogs surveys. In summary, the kit fox or the red-legged frog were not found on the project site. Hence, the habitat restoration project will not negatively impact those species and no adverse impacts or effects will occur.

SAN JOAQUIN KIT FOX

As advised by the USFWS and as per the California Department of Fish and Game's "Approved Survey Methodologies For Sensitive Species" (1990, Attachment A), we conducted the Daytime Line Transect Surveys for the San Joaquin Kit Fox on October 5, 2001. Surveys were conducted by Jerry Salazar (Biologist II) , Rick Thaxton (Construction Engineer), and Jeff Halstead (Chief, Environmental Division) from 09:00 to 13:00. The entire project site was walked. One inactive Coyote den was located in the northeastern area of the parcel. The den's entrance hole is about 13 inches in diameter. No tracks, prey remains, or recent scat was observed near the den. Old Coyote scat was found proximate to the den. One adult Coyote was observed in the southeastern area of the parcel. Coyote scat was found throughout the project site. No California Ground Squirrels or their burrows were observed on the site. No evidence of the kit fox such as dens, tracks, scat, or potential dens was found. We conclude that the San Joaquin Kit Fox does not occur on the project site and that no adverse impacts or effects will occur.

CALIFORNIA RED-LEGGED FROG

As advised by the USFWS and as per their "Guidance on Site Assessment and Field Surveys for California Red-legged Frogs" (1997, Attachment B), we conducted field surveys to evaluate the occurrence of frogs on the Byrd Slough Habitat Restoration Site.

Site Assessment

The Byrd Slough Habitat Restoration Site is outside the current range of the California Red-legged Frog. No current or historic frog records are known from the Byrd Slough Habitat Restoration Site. The California Natural Diversity Data Base (2001) does not show any frog records from the Piedra 7.5 minute quadrangle map or the eight surrounding quadrangle maps (Attachment C). Historic records received from the USFWS (October 2001) for Fresno County include Fresno, Sampson Flats 7 miles north of Dunlap, Minkler (= Byrd Slough), and a few sites in the western part of the county (Attachment D). The Minkler record is from 1916 and is about 3 miles south of the project site. Frogs have not been reported from this general area for decades and are believed to have been extirpated (CDFG 1994, Attachment E). The USFWS (2000) reported two core areas for existing frogs in western Fresno County which include Little Panoche Valley and Panoche Area (Attachment F). Those sites occur across the San Joaquin Valley and over 80 miles away from the Byrd Slough Habitat Restoration Site.

A habitat map of the Byrd Slough Habitat Restoration Site is presented in Attachment G. A detailed description of the habitats occur in Jones & Stokes Associates Inc. (1998) report titled "Friant-Kern Canal Restoration Site, Fresno County, California: Site Conditions and Conceptual Alternatives for Restoration." Areas of potential frog habitat include Byrd Slough and a small (70' X 30' X 4") pond (see photographs, Attachment H). Byrd Slough is a 10 to 35 foot wide slow-flowing waterway with pools, backwaters, and dense wetland and riparian vegetation. The slough's flow varies with that of the Alta Main Canal and the irrigation demand. Typical vegetation is a thicket of blackberry, wild rose, valley oak, willows, cottonwoods, ash, buttonbush, cattail, rush, and pondweed. The slough has many Mosquitofish throughout its length and Large-mouth Bass were observed in the larger pools. The small pond has a cobble substrate, a patch of bull rush, clumps of rush around the perimeter, and a dense covering of pondweed. This wetland is tied hydrologically to the Alta Main Canal, its seepage, and an intermittent spring. No Mosquitofish or other fish were observed in the pond. The Alta Main Canal is 50 foot wide, shallow, flat-bottomed canal with rush and a few riparian trees along its edge.

Byrd Slough and the pond are depicted on the attached habitat map of the project site (Attachment F). The other "Seasonal and Permanent Wetland" habitats denoted on the map were checked, but were dry. Also, the Kings River itself was checked, but no backwater or marshy areas occur along the river. The annual occurrence of high flows (@ 6,000 cfs) for several months, low flows (@ 100 cfs) for several months, lack of hiding cover at low flows, cobble substrate, lack of submergent vegetation, and predatory coldwater and warmwater fishes renders the river unsuitable for red-legged frogs (see photographs, Attachment I). Lands surrounding the project site are irrigated pastures, orchards, and oak woodlands.

Survey Methods

The survey methods used are those recommended by the USFWS (1997). Both day-surveys and night-surveys were conducted on October 8 and 10, 2001 by Jerry Salazar (Biologist II) and Jeff Halstead (Chief, Environmental Division). We walked the edge of Byrd Slough, the small pond, and Alta Main Canal looking for frogs. Frogs were viewed with binoculars and identified using several field guides and an identification card from the Coarsegold Resource Conservation District's (1997) Frog Identification - Landowner Certification Program training class. At night, headlamps and large flashlights (4 D-size batteries) were used to locate and illuminate frogs.

Survey Results

October 8th, Day-Survey

Surveys were conducted from 15:00 to 18:30. Air temperature was about 80 degrees Fahrenheit, the sky was clear and sunny, and no wind was present. No frogs were observed along Byrd Slough or in the Alta Main Canal. At the small pond, 2 young Bullfrogs (@ 2-3" in length) and several tadpoles were observed.

October 8th, Night-Survey

Surveys were conducted from 19:30 to 21:30. Air temperature was about 74 degrees Fahrenheit, the sky was clear, and no wind was present. Along Byrd Slough 11 adult Bullfrogs were observed. At the small pond, findings were the same as during the day-survey. Two adult Bullfrogs were also observed in the Alta Main Canal adjacent to the pond.

October 10th, Day-Survey

Surveys were conducted from 15:15 to 18:15. Air temperature was about 82 degrees Fahrenheit, the sky was clear and sunny, and no wind was present. Four frogs jumped along the Byrd Slough, but none were identified. No frogs were observed along the Alta Main Canal. At the small pond, about 20 young Bullfrogs (@ 2-3" in length) and several tadpoles were observed.

October 10th, Night-Survey

Surveys were conducted from 19:00 to 21:15. Air temperature was about 70 degrees Fahrenheit, the sky was clear, and no wind was present. Along Byrd Slough 12 adult Bullfrogs were observed. At the small pond, findings were the same as during the day-survey. No frogs were observed in the Alta Main Canal.

Conclusion

The habitat restoration activities proposed at the Byrd Slough Habitat Restoration Site will not impact wetlands or riparian areas. No red-legged frogs were found on the Byrd Slough Habitat Restoration Site during day-time and night-time protocol surveys. We

conclude that the California Red-legged Frog does not occur on the project site and that no adverse impacts or effects will occur.

Sincerely,

J. A. Halstead

Jeffrey A. Halstead
Chief, Environmental Division

JAH/mec
L01-0207

Attachments: As Stated

cc: Jack Sinor (KRCD)
Rick Thaxton (KRCD)
Judy Soutiere (Corps)

ATTACHMENT A

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Gover

EPARTMENT OF FISH AND GAME
GION 4
J4 East Shaw Avenue
rresno, CA 93710
(209) 222-3761

May 8, 1990

Dear Sensitive Species Surveyor

Attached are the survey methodologies for San Joaquin kit fox, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat and San Joaquin antelope squirrel. These methodologies were developed by Region 4 of the California Department of Fish and Game with input from the United States Fish and Wildlife Service, the Bureau of Land Management and various species experts. Standardized methodologies were developed to provide consultants, local, state and federal agencies with minimum acceptable standards for surveys that are conducted to determine the presence of state-listed species. All project specific surveys conducted after June 15, 1990 should use these methodologies. We want to emphasize that these survey methods were designed to optimize the chance of detecting the presence of a listed species should it occur on a project site. They are not designed to determine the absence of a species. If a listed species presence is detected prior to conducting surveys using these techniques, no additional surveys need to be conducted until the Regional office is contacted.

When the presence of a listed species is detected, we request you notify the Region 4 office at (209) 222-3761 for further instructions on what additional information will be needed to assess the projects's potential impact on listed species. This will assist in expediting the review of the project and help control the project sponsors biological survey costs. We also suggest that the USFWS be contacted for further advice as soon as federally-listed species are detected.

Field surveyors should also be aware that both state and federal permits are required for trapping/handling of listed species. For further information regarding permits for state-listed species, please contact Mr. John Gustafson at (916) 322-1260. For additional information regarding permits for federally-listed species, please contact the USFWS at (916) 978-4866. Please remember that if you are trapping within the known range of a listed species, the possibility exists that you may capture a listed species. Absent a permit from the Department and USFWS for their capture, you could be in violation of the State and/or Federal Endangered Species Acts.

If you have any questions, comments regarding the methodologies or if you want to propose the use of alternative methodologies, please contact Ron Rempel, Associate Wildlife Biologist, at the above address or telephone number.

Sincerely,

Del F. Mitchell

for George D. Nokes
Regional Manager

Attachments

MINIMUM REQ.

The following survey methods were developed to determine the presence of a species, not the absence. They are not designed to determine the density of the species nor the quality of the habitat based on the number of sightings. When a listed species is detected, surveys for that species may be discontinued (burrow and precinct mapping should be completed) and the agencies notified (USFWS and DFG). At that time we will discuss with the applicant and consulting biologist what additional specific studies (if any) must be conducted to determine: (1) the level of impact that a project will have on the species; (2) how the project can be modified to reduce impacts; and (3) appropriate mitigation measures.

Please remember that take (including harassment and trapping) of listed species is prohibited unless appropriate permits are obtained. As professional biologists conducting surveys, every effort should be made to accurately determine if a listed species is present. If a species is present and you fail to detect it, project proponents could encounter significant delays in their project or be placed in a situation where they may violate the State and/or Federal endangered species acts. If you have a question or would like to propose a modification of the survey methods for a specific project, please contact the Department at (209) 222-3761 or the USFWS at (916) 978-4866.

CALIFORNIA DEPARTMENT OF FISH AND GAME
REGION 4
APPROVED SURVEY METHODOLOGIES
FOR SENSITIVE SPECIES

SAN JOAQUIN KIT FOX, Vulpes macrotis mutica

Status: CT, FE

Methods: Three methods should be used to survey for San Joaquin kit fox (SJKF): 1) night spotlighting, 2) line transects (to identify known and potential den sites), and 3) scent stations.

1) Night spotlighting should be conducted on a minimum of six nights (within a 14-day period) using 400,000 (minimum) candle power spotlights. Surveys should be conducted using at least two observers with spotlights (one for each side of the road). For adequate visibility the observer's eye level should be a minimum of 60 inches above the road surface. This generally precludes the use of cars and small trucks for spotlight surveys. The survey vehicle should be operated at 10 m.p.h. or less. The entire project area should be surveyed, as well as approximately a two-mile area around the subject property. Vehicles should only be operated on existing roads to avoid adversely impacting endangered species or their habitat. Spotlighting should be conducted for a minimum of 3 hours each night and the routes should be varied so that specific locations are not spotlighted at the same time each survey period. Whenever eyeshine or animal movement is detected, the vehicle should be stopped and the animal identified using binoculars (minimum 7x35) or spotting scopes. Sightings of SJKF, their prey, and competing predators should be recorded for later mapping, and the time, mileage, weather, and moon phase noted. Spotlight surveys should not be conducted when visibility is less than 2 miles.

Please complete only this method at this time

2) Daytime line transect surveys for dens, tracks, scat, etc., should be conducted by walking the property at 10-30 meter (30 to 100-foot) intervals so that the area is completely covered in a systematic manner. Transect width should be adjusted based on vegetation height, topography, etc., to facilitate the detection of dens and other sign. When a den or burrow is discovered, the observer should determine if it has the potential to be used by SJKF and if it is currently occupied (please refer to the attached USFWS SJKF den definitions). Potential burrow openings are generally round or oval in shape, 10-25 centimeters (4-10 inches) in diameter, and often have multiple openings. SJKF activities at a den site should be determined by noting a variety of factors (fresh digging, presence of prey remains, tracks, or scat near the opening). All known and potential dens should be accurately mapped. Photographs of the dens should be taken along with information on topography, vegetation, land use, den characteristics, and activity.

3) Scent stations should be established at a minimum density of five scent stations per 640 acres. One scent station should be placed at the center of the project site with the other four placed 1/4 mile away (i.e. a domino 5 pattern). A minimum of 5 scent stations is required for all projects unless otherwise agreed to by CDFG and USFWS. If a linear corridor is being surveyed, five scent stations should be established per linear mile. Scent stations should not be set adjacent to heavily traveled roads to reduce the potential for kit fox/vehicle collisions. Scent stations should be operated for a minimum of six nights (within a 14-day period), and checked each morning for visitation, re-baited and tracks cleared when necessary. All tracks observed (i.e. kit fox, dogs, kangaroo rats, etc.) should be recorded on pre-formatted data sheets.

Scent stations should be situated on relatively level ground and cover a circle approximately 1 meter (39-inches) in diameter. All vegetation and debris should be cleared and a thin layer (1-2 cm) of fine-grained tracking material (diatomaceous earth, fire clay, finely sifted soil) sifted over the site. (The tracking substrate must be of a consistency to delineate the lines of a human hand when placed on the tracking medium). Smoked tracking plates are also acceptable. The scent stations should be baited with cat food placed at the center of the scent station (i.e. directly on the tracking substrate) or with "Predator Survey Disks". Because kit fox have been observed to occasionally avoid scent stations baited with predator survey disks and fish-based baits, no more than 50% of the scent stations should use these types of bait. The disks are available from Pocatello Supply Depot, 238 E. Dillon, Pocatello, ID 83201, or (208) 236-6920.

Timing: The optimum survey period is between May 1 and September 30. Surveys conducted outside of the optimum period should include a minimum ten nights of scent station operation. The period of lowest detectability is December, January and February. Survey methods for detecting kit fox during these months should be reviewed with the agencies prior to commencing field work. When presence of SJKF is confirmed, the agencies should be contacted for further instructions.

Species Expert:

Dan Williams
CSU Stanislaus
Department of Biological Sciences
Turlock, CA 95380
(209) 667-3476 or (209) 667-3485

Sue Orloff
BioSystems Analysis Inc.
3152 Paradise Drive, Bldg. 39
Tiburon, CA 94920
(415) 435-0399

Linda Spiegel
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814
(916) 324-3230

FAX TRANSMISSION

U.S. FISH AND WILDLIFE SERVICE
2800 COTTAGE WAY, ROOM W-2605
SACRAMENTO, CALIFORNIA 95825
PHONE: (916) 414-6575
FAX: (916) 414-6712 or 6713

RECEIVED K.R.C.D.
OCT - 2 2001
File No.________

TO: Jeff Halstead

FAX #: 559-237-5560

FROM: CAROLINE PROSE

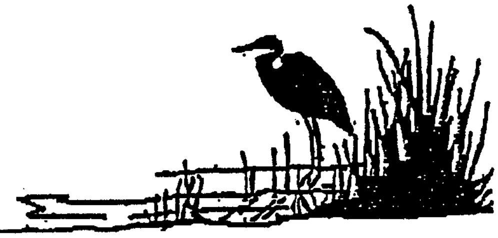
DATE: 10/2/01

PAGES: 6, including this cover sheet

SUBJECT: Survey methodology for the San Joaquin Kit fox.

COMMENTS:

Please call me if you have any questions.
Thank you!
Caroline



ATTACHMENT B

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Sacramento Field Office
3310 El Camino Avenue, Suite 130
Sacramento, California 95821

IN REPLY REFER TO:

1-1-97-TA-1093

April 4, 1997

Memorandum

To: Distribution

From: Field Supervisor, Sacramento Field Office, Sacramento, California

Subject: Dissemination of Interim Guidance on Site Assessment and Field Surveys for California Red-Legged Frogs

The U.S. Fish and Wildlife Service (Service) provides the attached interim guidance for determining habitat suitability and presence or absence of California red-legged frogs (*Rana aurora draytonii*) during the 1997 survey season. The Service will be evaluating the appropriateness of this guidance for accuracy, usefulness of data, and implementation. The attached guidance is provided on an interim basis and is subject to revision at any time. Successful implementation of the subject guidance will require ongoing contact with the Service before, during, and after site assessments and field surveys. Questions regarding this guidance may be addressed to Mr. Wayne S. White, Field Supervisor, Sacramento Field Office at (916) 979-2710.

Dale A. Pierce
for Wayne S. White

Attachments

lsd frost frog

February 18, 1997
U.S. Fish and Wildlife Service
Guidance on Site Assessment and Field Surveys for California Red-legged Frogs

I. Introduction

A final rule determining threatened status for the California red-legged frog under the Endangered Species Act of 1973, as amended (Act), was published on May 23, 1996 (61 *Federal Register* 25813) and became effective on June 24, 1996. Since then the United States Fish and Wildlife Service (Service) has received numerous requests from private and government entities for guidance in planning for the protection of the California red-legged frog at the sites of proposed developments or of other land use activities. This document provides guidance for two procedures to accurately assess California red-legged frog status in the vicinity of a project site: (1) an assessment of California red-legged frog locality records and potential California red-legged frog habitat in and around the project area; and (2) focused field surveys of aquatic habitats to determine whether California red-legged frogs are present. Both procedures may be recommended because California red-legged frogs are mobile and, during different life history stages or different seasons of the year, may occupy a variety of aquatic and upland habitats. Both procedures should be incorporated into any assessment of the potential effects of projects on California red-legged frogs, unless field surveys are determined to be unnecessary based on the site assessment (see "Interpreting the results of the site assessment" section).

Ongoing contact and discussions with the Service before, during, and after site assessments and field surveys are a crucial element of this guidance. Results of the site assessment and field survey should also be reported to the Service (see "Reporting the results" sections below); however, results of the site assessment should be reported prior to proceeding with field surveys. The addresses and phone numbers of the appropriate field office are provided in section V below.

II. Site Assessment

Careful evaluation of the following information about California red-legged frogs and their habitats in the vicinity of projects or other land use activities is important because this information indicates the likelihood that California red-legged frogs may occur on the project site.

Protocol

1. Is the project site within the range of the California red-legged frog?

Because knowledge of the distribution of the California red-legged frog is likely to change as new locality information becomes available, surveyors should contact the appropriate Service field office (see section V below) to determine if a project site is within the range of this species.

2. What are the known localities of California red-legged frogs within the project site and within 8 kilometers (km) (five miles) of the project boundaries?

The surveyor should consult the Natural Diversity Data Base (NDDB) maintained by the California Department of Fish and Game's (CDFG) Natural Heritage Division to determine known localities of California red-legged frogs. Information on the NDDB is attached to the end of this document. Other information sources on local occurrences of California red-legged frogs should be consulted. These sources may include, but are not limited to, biological consultants, local residents, amateur herpetologists, resource managers and biologists from municipal, State, and Federal agencies, environmental groups, and herpetologists at museums and universities. The surveyor should report to the Service all known California red-legged frog localities within the project site and within 8 km of the project boundaries.

3. What are the habitats within the project site and within 1.6 km (one mile) of the project boundaries?

Describe the upland and aquatic habitats within the project site and within 1.6 km of the project boundaries. The aquatic habitats should be mapped and characterized (e.g., ponds vs. creeks; pool, riffle, rootball, vegetation) The information provided in section 4 of the attached appendix serves as a guide to the features that will indicate possible California red-legged frog habitat.

Reporting the results of the site assessment. Surveyors should prepare a report that includes the following: photographs of the project site, survey dates and times, names of surveyors, a description of the methods used, and a map of the site showing habitat as requested in section II(3) above. The report should include copies of those portions of the 7.5' topographic quads that contain the site and the area within 1.6 km of its boundaries. A list of California red-legged frog localities as requested in section II(2) above should be included. The report should be provided to the appropriate Service field office (see section V below).

Interpreting the results of site assessment. After completing elements 1-3 of the site assessment above, the appropriate Service field office should be contacted for technical assistance. Based on the information provided from the site assessment, the Service will provide guidance on how California red-legged frogs should be addressed, including whether field surveys are needed or whether incidental take authorization should be obtained through section 7 consultation or a section 10(a)(1)(B) permit pursuant to the Act. A protocol for field surveys is presented below.

III. Field surveys

Frogs can be detected opportunistically in various habitats depending on weather and time of year. Aquatic sampling during the summer months is a reliable method of detecting frogs. Care should be taken to apply a level of effort and to use a style of surveying appropriate to the site. For instance, survey methods may differ according to habitat extent and type (e.g., deep

pond, shallow pond, creek). In addition, field work should be conducted according to the best professional judgement of the surveyor (e.g., dogs should not be brought on surveys as they disturb frogs). The Service recommends that surveyors have field experience in the identification of California amphibians. The Service is willing to cooperate with surveyors who have specific needs not addressed by this field survey protocol and who may wish to propose alternative methods.

Protocol

1. Surveys should be conducted between May 1 and November 1. These sampling dates were selected because they allow surveys to be conducted with minimal disturbance of breeding frogs, eggs, or tadpoles during a period when frogs can be reliably detected.

2. All aquatic habitat identified during the site assessment should be surveyed four times, twice during the day and twice at night. Surveyors should wait at least twenty-four hours and possibly longer, to meet the environmental conditions described in section III(3) below, before repeating surveys at the same site.

3. Day-surveys should be conducted on clear, sunny days. Night-surveys should be conducted on warm, still nights between one hour after sunset and 12 midnight. Warm, still nights are preferable for surveying because the probability of observing frogs tends to decrease under cold, windy conditions. In some circumstances where safety issues preclude night-surveys, the Service can provide alternatives to the surveyor on a case-by-case basis to ensure that safe surveys are conducted.

4. Surveyors should work along the entire shore (either on the bank or in the water), visually scanning all shoreline areas in all aquatic habitats identified during the site assessment. This methodology should be applied to both day- and night-surveys. In the case of water bodies covered with floating vegetation such as duckweed, both the shoreline and surface of the water should be scanned. When wading, surveyors should take maximum care to avoid disturbing sediments, vegetation, and any visible larvae. When walking on the bank, surveyors should take care to not crush rootballs, overhanging banks, and stream side vegetation that might provide shelter for frogs.

5. When conducting night-surveys for eyeshine, flashlights and headlamps that use one 6-volt or four to six D-cell batteries are recommended. High-powered spotlights are prohibited to avoid harming frogs.

6. Although not required, photographs of frogs observed during field surveys may aid in verification of species identifications. Surveyors should limit photography to the extent necessary to document the presence of California red-legged frogs and should not attempt to photograph frogs if this is likely to disturb them.

Reporting the results of field surveys. Any information on California red-legged frog distribution resulting from field surveys should be sent to the NDDB administered by the CDFG. Information about the NDDB is attached to the

end of this document. Copies of the NDDB form should be mailed immediately to both the Service and CDFG.

Surveyors should also prepare a final report that includes the following: copies of all field notes, data sheets, photographs of the project site and of frogs observed, and a typed summary providing survey dates and times (both begin and end times), names of surveyors, temperature (water and air), wind speed, a description of the methods used, numbers and size classes of all amphibians observed, a map of the site showing survey locations, habitat and frog sightings, a copy of the NDDB form, and a description of possible threats to California red-legged frogs observed at the site. The report should be provided to the appropriate Service field office (see section V below).

Interpreting the results of field surveys. Based on the results of field surveys, the Service will provide guidance on how California red-legged frog should be addressed. If California red-legged frogs are found, the Service will work with the project proponent through the section 7 or section 10(a)(1)(B) process to determine a further course of action, including the consideration of avoidance or minimization measures and whether incidental take authorization is needed. If frogs are observed but not identified to species, additional survey effort may be recommended. If the Service recommended that field surveys be conducted and if California red-legged frogs were not identified during these field surveys conducted according to this protocol, the Service will consider the California red-legged frog not to be present on the project site and will not recommend any further take avoidance or mitigation measures. The Service may question the results of field surveys conducted under this protocol for any of the following reasons: 1) if the appropriate Service field office was not contacted prior to field surveys being conducted; 2) if field surveys were conducted in a manner inconsistent with this protocol; 3) if field surveys were incomplete; or 4) if the reporting requirements, including submission of NDDB forms, were not fulfilled.

IV. Statement on permitted activities.

This field survey protocol allows for conducting visual surveys for California red-legged frogs. Surveys following this protocol do not require a section 10(a)(1)(A) recovery permit pursuant to the Act. Activities that would require a section 10(a)(1)(A) recovery permit include: 1) any capture or handling of California red-legged frog adults, larvae, or eggs; 2) any activity intended to significantly modify the behavior of California red-legged frogs; 3) any activity that subjects California red-legged frogs to some environmental condition not naturally present (e.g., experiments designed to study a frog's response to heat, moisture, noise) other than low-level illumination for night surveys as described in section III(5); and 4) any survey methods not covered in this field survey protocol if any form of "take" would occur during such activities. All surveyors using this field survey protocol should make all possible efforts to avoid unintentionally disturbing California red-legged frogs or their habitat. Surveyors should direct inquiries about section 10(a)(1)(A) recovery permits to the Service's Regional Office (see section V below).

V. Service Contacts

For project sites and land use activities in Santa Cruz, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, portions of Los Angeles and San Bernardino Counties outside of the Los Angeles Basin, and portions of Kern, Inyo and Mono Counties east of the Sierra Crest and south of Conway Summit, contact:

Ventura Field Office,
2493 Portola Road, Suite B
Ventura, California, 93003
(805/644-1766).

For project sites and land use activities in all other areas of the State south of the Transverse Ranges, contact:

Carlsbad Field Office
2730 Loker Avenue West
Carlsbad, California, 92008
(619/431-9440).

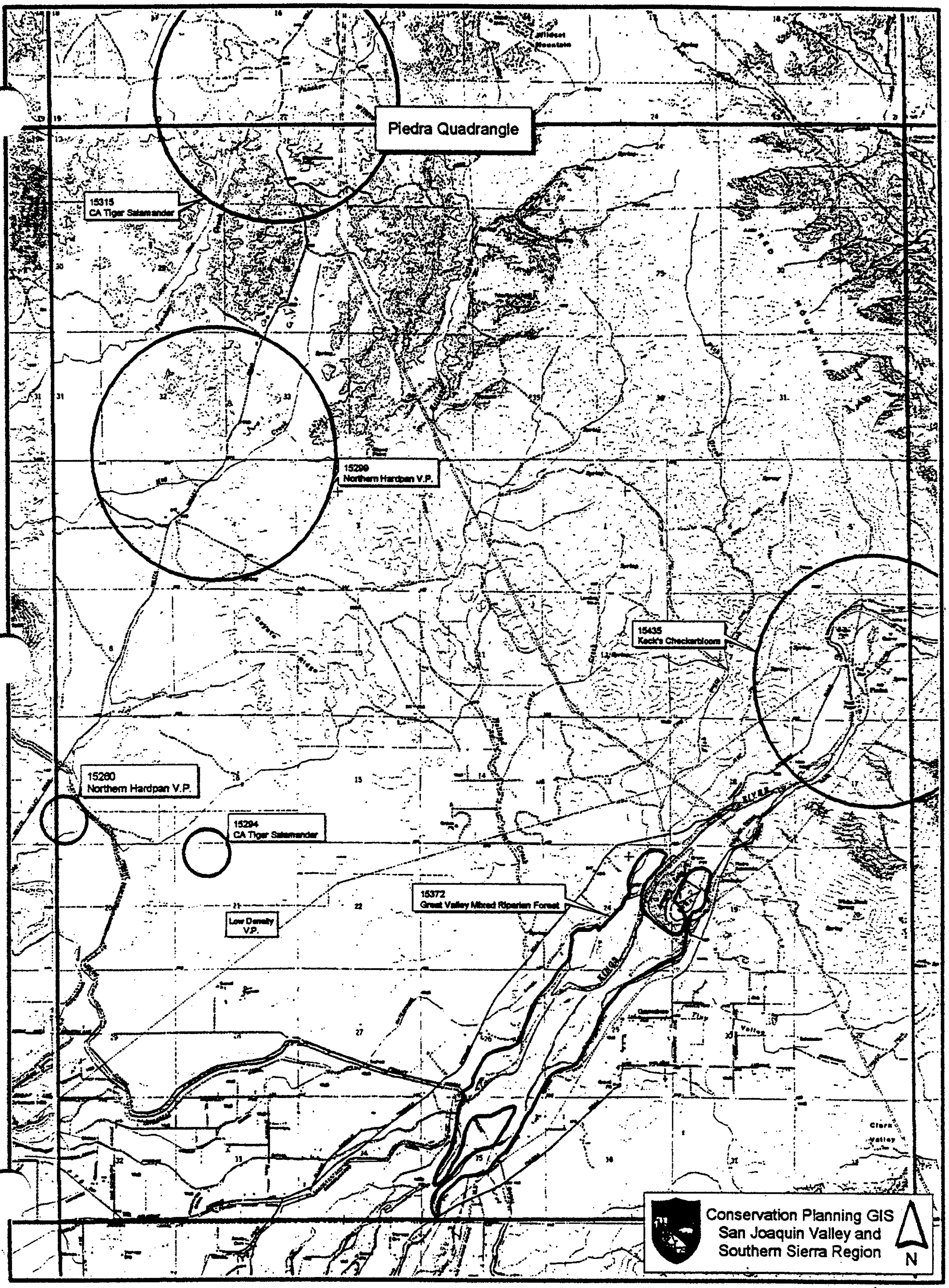
For project sites and land use activities in all other areas of the State, contact:

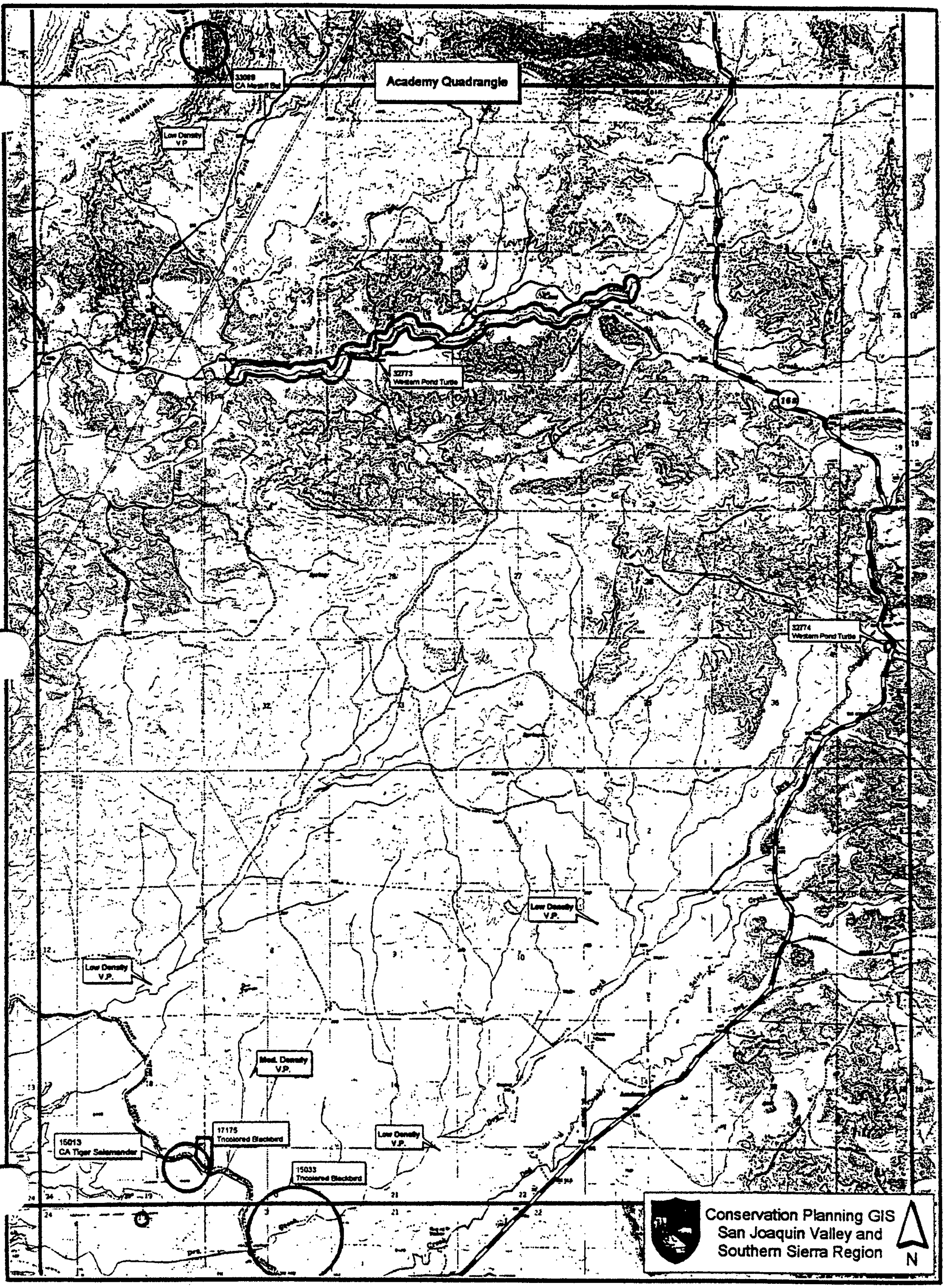
Sacramento Field Office
3310 El Camino Avenue, Suite 130
Sacramento, California 95821
(916/979-2725).

For information on section 10(a)(1)(A) recovery permits, contact:

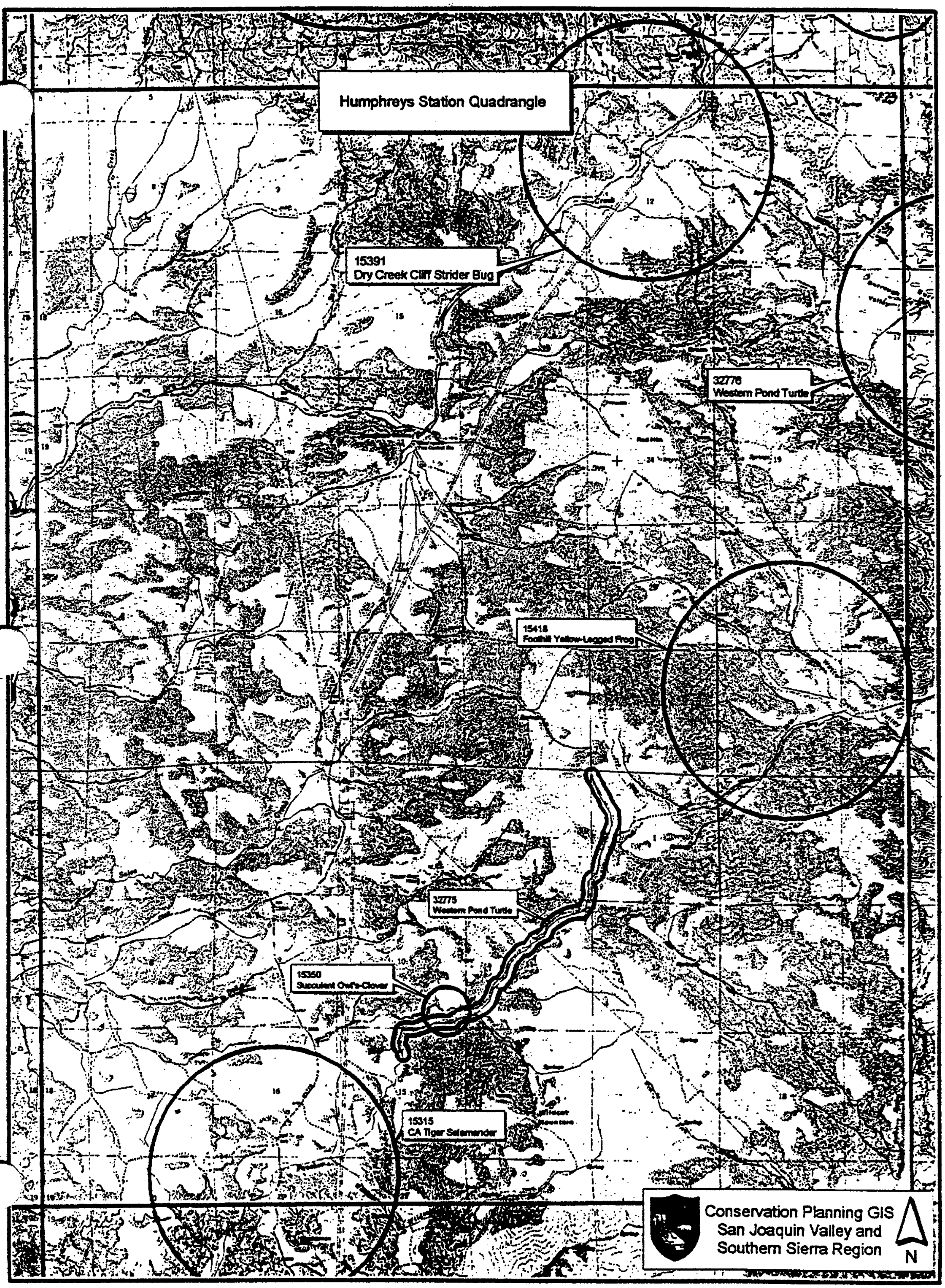
Regional Office,
Eastside Federal Complex
911 N.E., 11th Avenue
Portland, Oregon 97232-4181
(503) 231-6241.

ATTACHMENT C

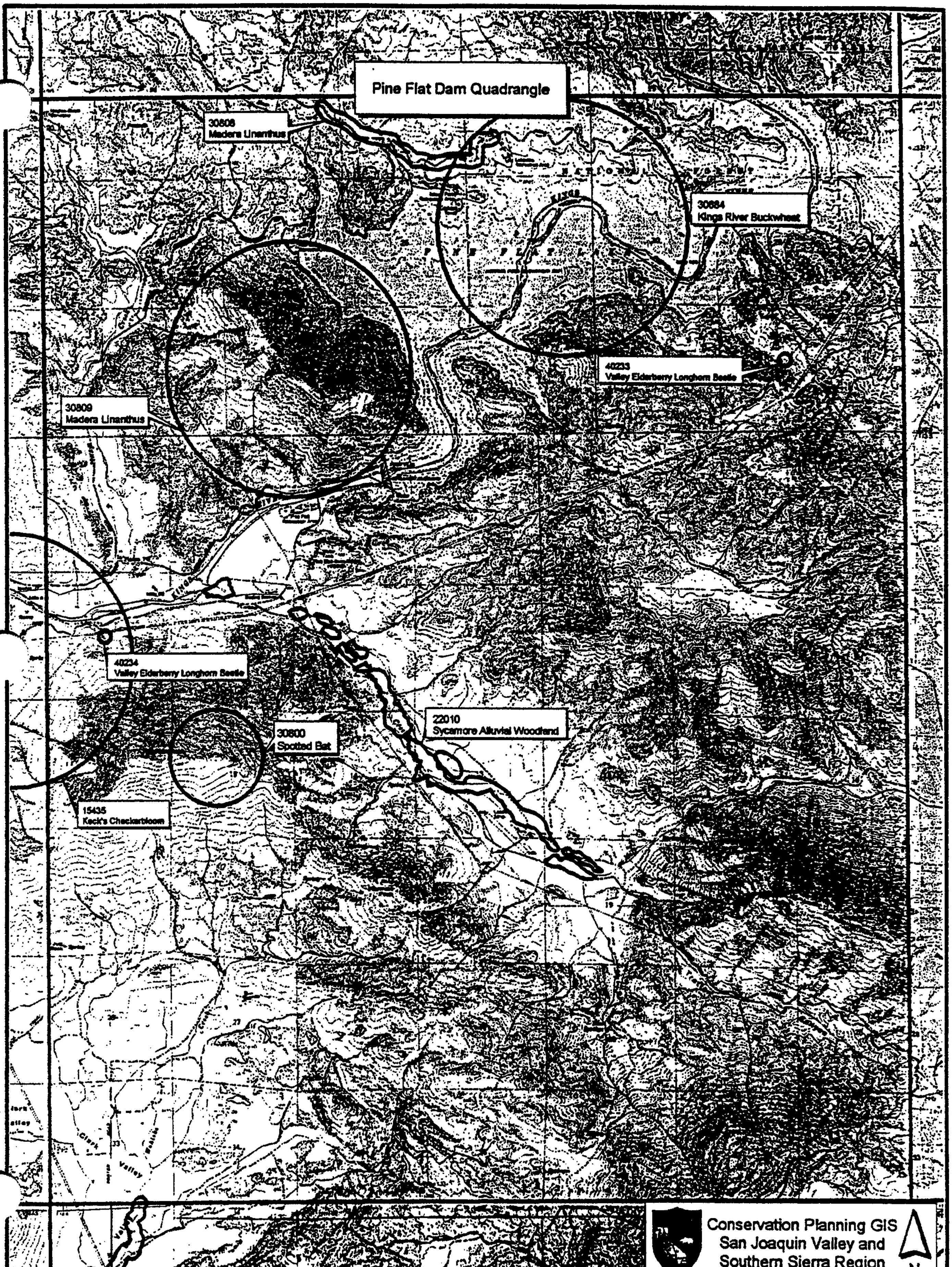

Piedra Quadrangle
15315
CA Tiger Salamander
15299
Northern Hardpan V.P.
15435
Keck's Checkerbloom
15280
Northern Hardpan V.P.
15294
CA Tiger Salamander
15372
Great Valley Mixed Riparian Forest
Low Density
V.P.
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N



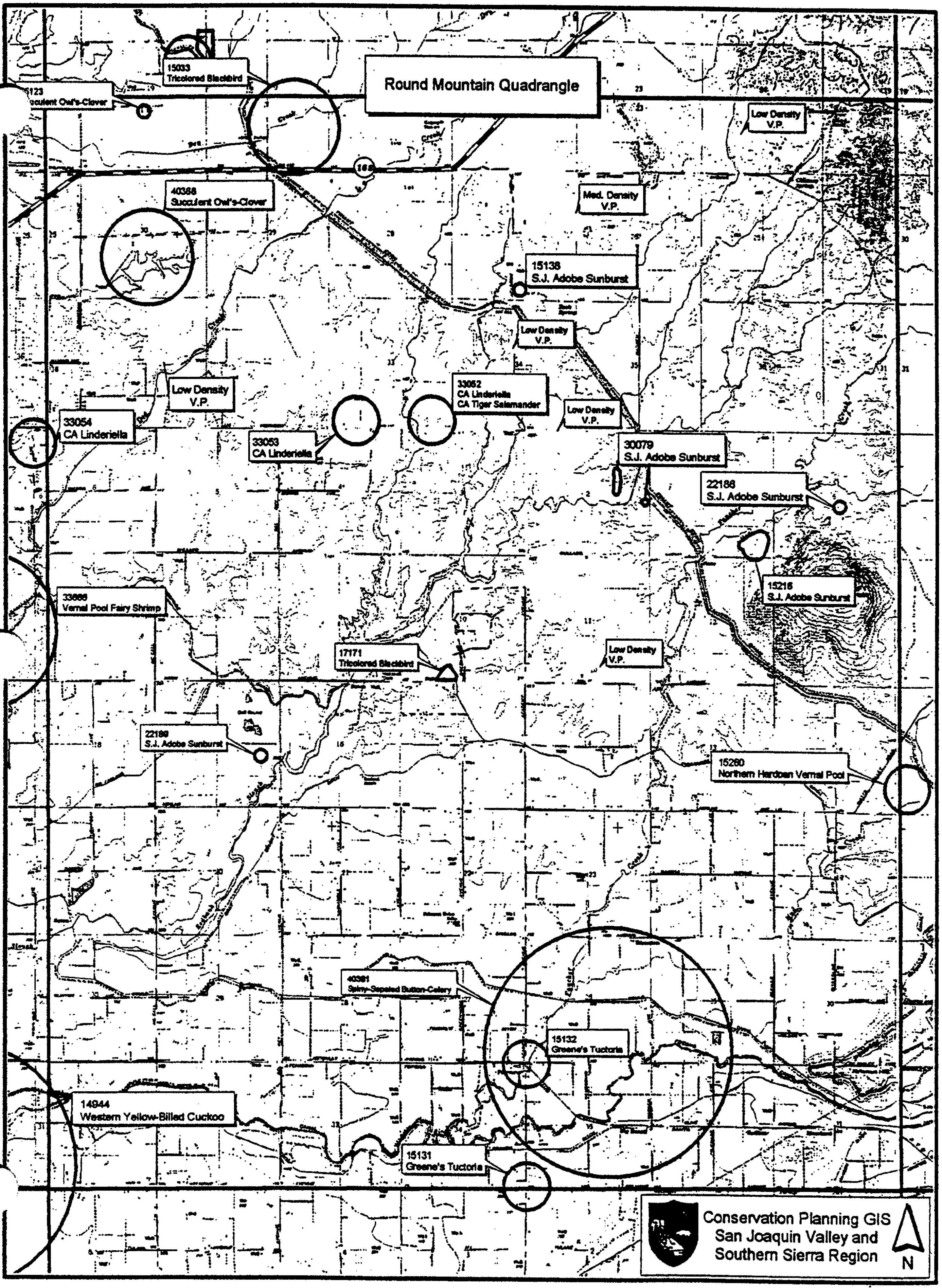
Academy Quadrangle
33089
CA Mastiff Bat
Low Density
V.P.
32773
Western Pond Turtle
32774
Western Pond Turtle
Low Density
V.P.
Low Density
V.P.
Med. Density
V.P.
15013
CA Tiger Salamander
17175
Tricolored Blackbird
15033
Tricolored Blackbird
Low Density
V.P.
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N



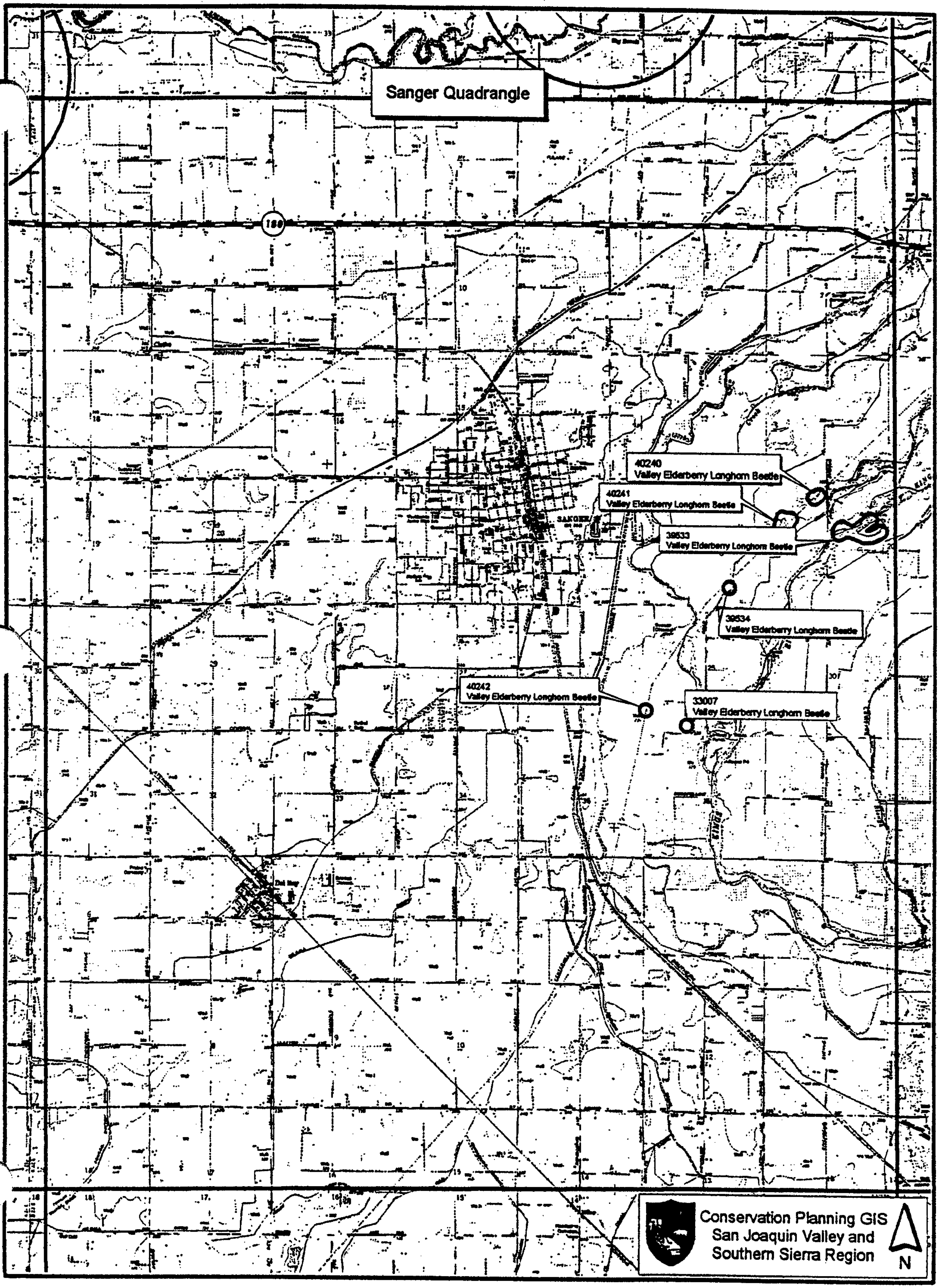
Humphreys Station Quadrangle
15391
Dry Creek Cliff Strider Bug
32776
Western Pond Turtle
15418
Foothill Yellow-Legged Frog
32775
Western Pond Turtle
15350
Succulent Owl's-Clover
15315
CA Tiger Salamander
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N



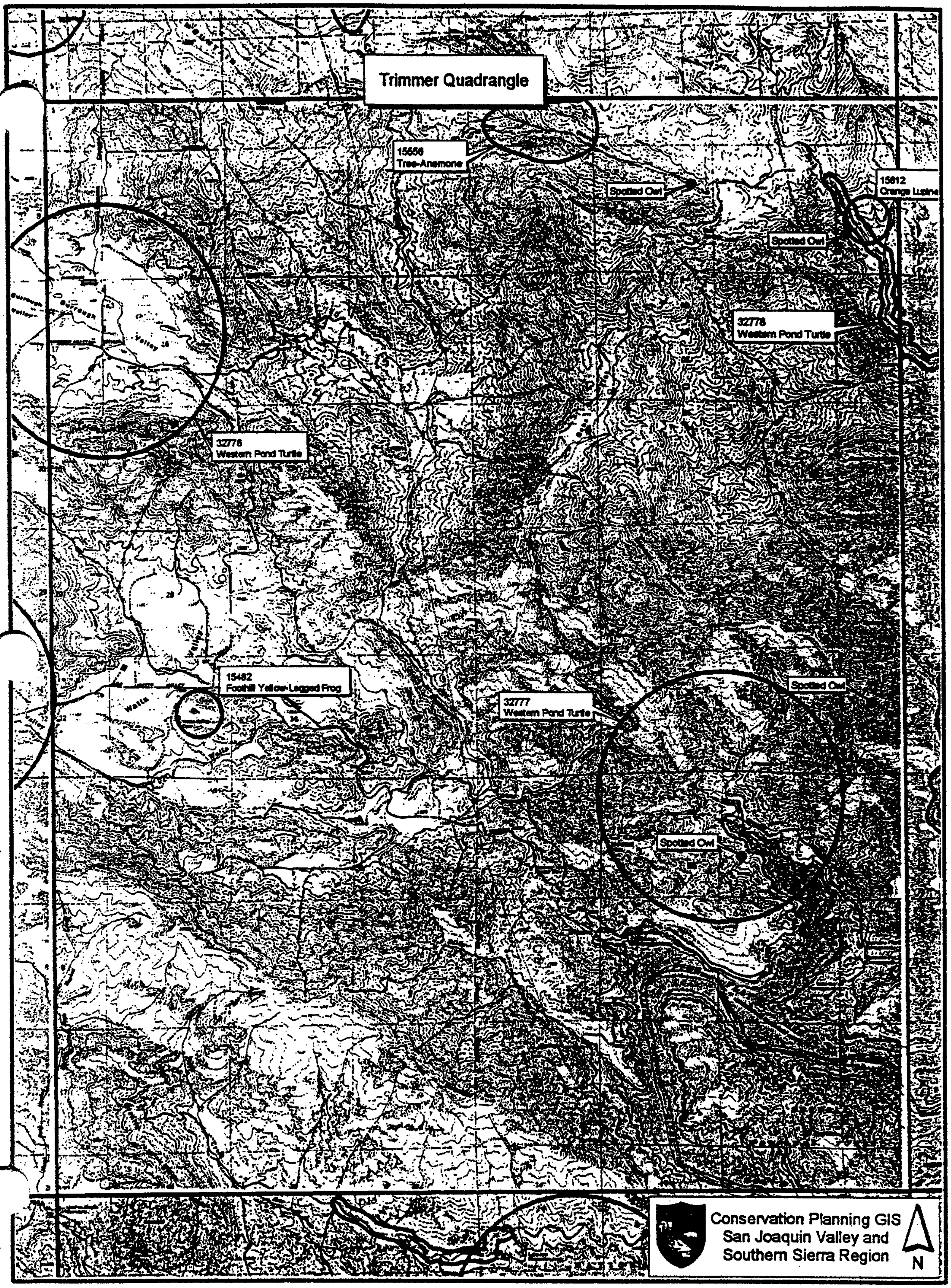
Pine Flat Dam Quadrangle
30808
Madera Linanthus
30664
Kings River Buckwheat
40233
Valley Elderberry Longhorn Beetle
30809
Madera Linanthus
40234
Valley Elderberry Longhorn Beetle
22010
Sycamore Alluvial Woodland
30800
Spotted Bat
15435
Keck's Checkerbloom
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N

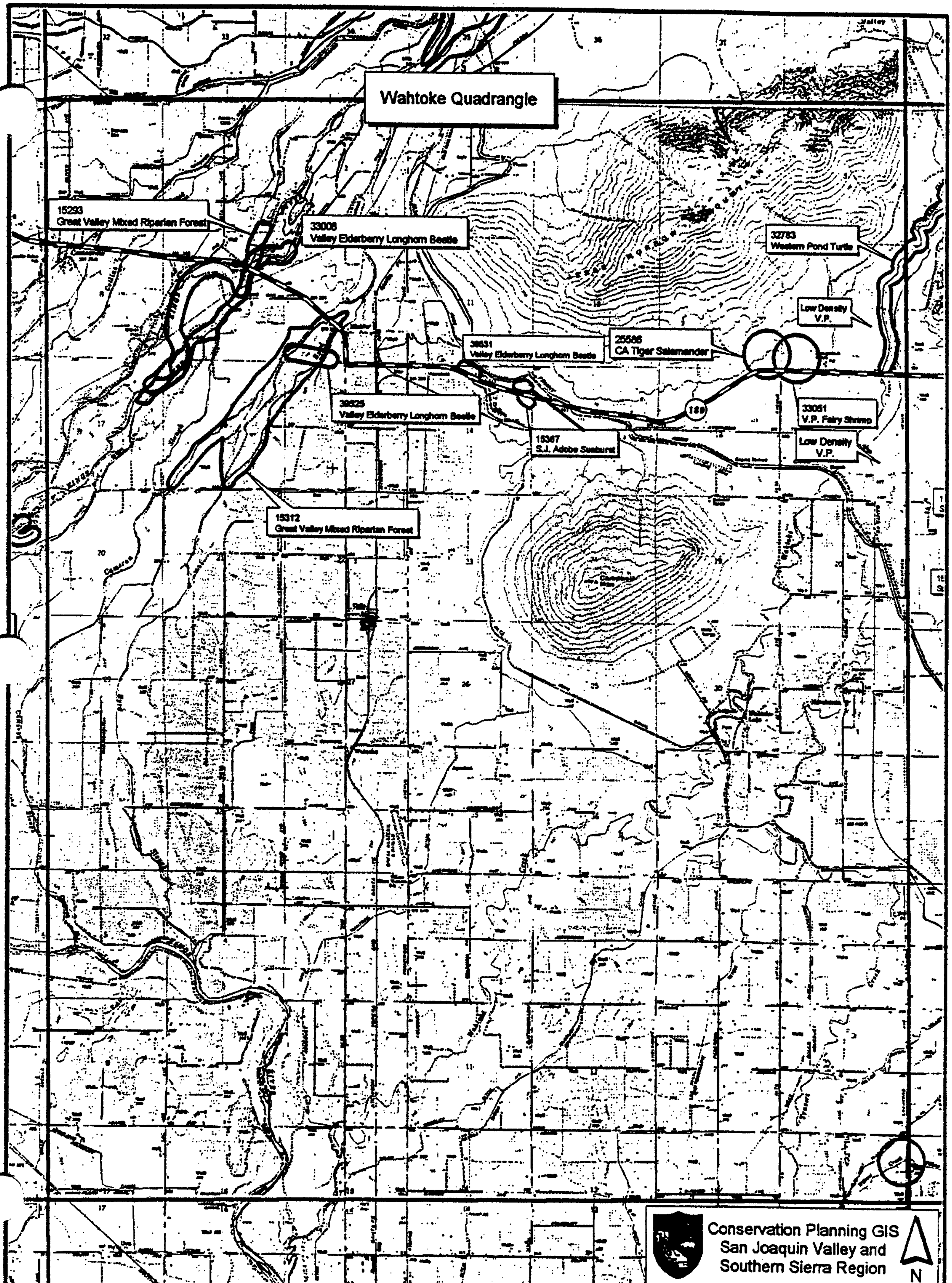


Round Mountain Quadrangle
15033
Tricolored Blackbird
15123
Succulent Owl's-Clover
40388
Succulent Owl's-Clover
Low Density
V.P.
Med. Density
V.P.
15138
S.J. Adobe Sunburst
Low Density
V.P.
Low Density
V.P.
33052
CA Linderiella
CA Tiger Salamander
Low Density
V.P.
33054
CA Linderiella
33053
CA Linderiella
30079
S.J. Adobe Sunburst
22188
S.J. Adobe Sunburst
15216
S.J. Adobe Sunburst
33686
Vernal Pool Fairy Shrimp
17171
Tricolored Blackbird
Low Density
V.P.
22189
S.J. Adobe Sunburst
15260
Northern Hardpan Vernal Pool
40381
Spiny-Sepaled Button-Celery
15132
Greene's Tuctoria
14944
Western Yellow-Billed Cuckoo
15131
Greene's Tuctoria
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N

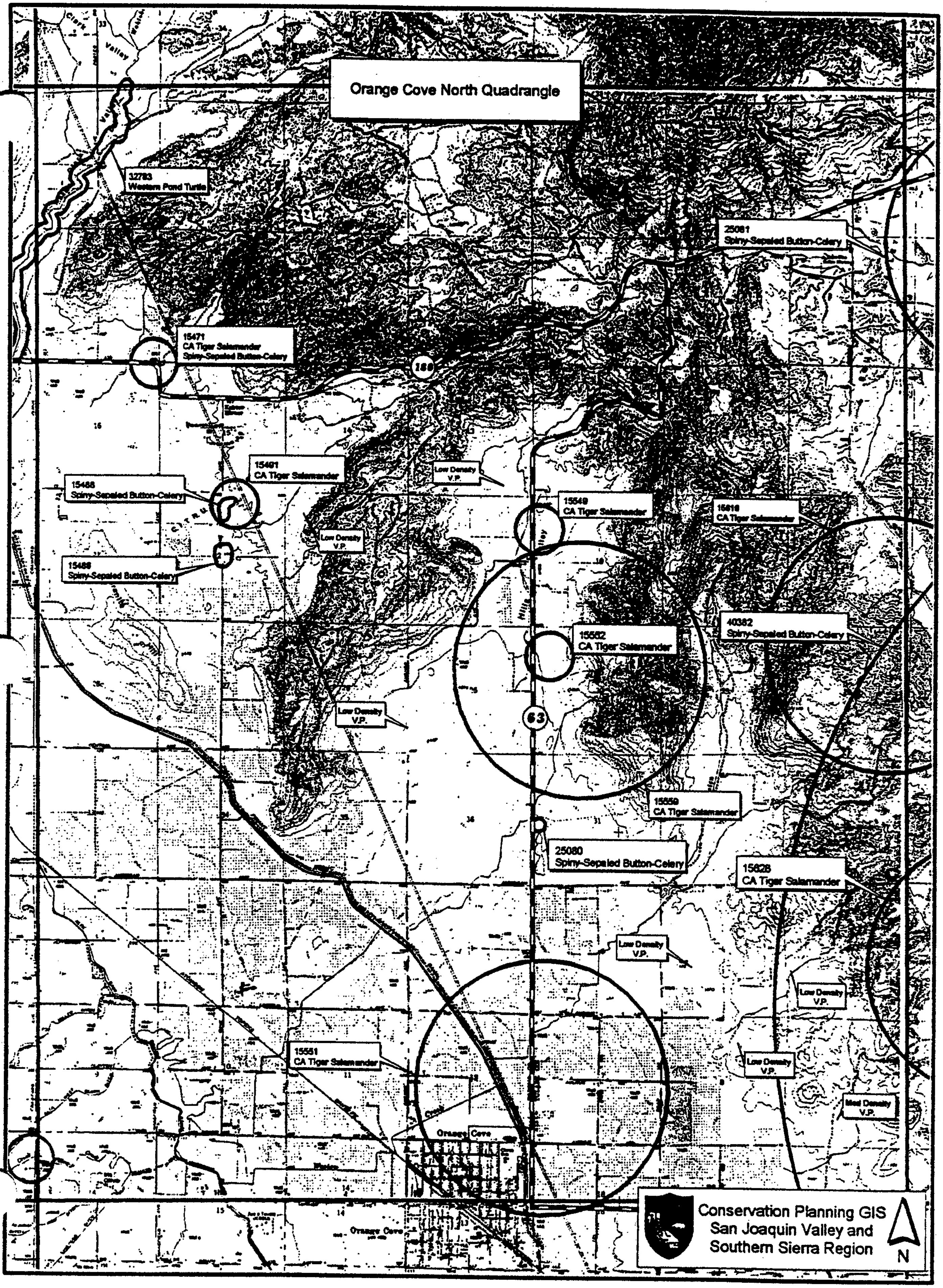


Sanger Quadrangle
40240
Valley Elderberry Longhorn Beetle
40241
Valley Elderberry Longhorn Beetle
39533
Valley Elderberry Longhorn Beetle
39534
Valley Elderberry Longhorn Beetle
40242
Valley Elderberry Longhorn Beetle
33007
Valley Elderberry Longhorn Beetle
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N


Trimmer Quadrangle
15556
Tree-Anemone
Spotted Owl
15812
Orange Lupine
Spotted Owl
32778
Western Pond Turtle
32776
Western Pond Turtle
15482
Foothill Yellow-Legged Frog
32777
Western Pond Turtle
Spotted Owl
Spotted Owl
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N



Wahtoke Quadrangle
15293
Great Valley Mixed Riparian Forest
33006
Valley Elderberry Longhorn Beetle
32783
Western Pond Turtle
Low Density
V.P.
38631
Valley Elderberry Longhorn Beetle
25586
CA Tiger Salamander
38625
Valley Elderberry Longhorn Beetle
33051
V.P. Fairy Shrimp
15367
S.J. Adobe Sunburst
Low Density
V.P.
15312
Great Valley Mixed Riparian Forest
180
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N



Orange Cove North Quadrangle
32783
Western Pond Turtle
25081
Spiny-Sepaled Button-Celery
15471
CA Tiger Salamander
Spiny-Sepaled Button-Celery
180
15491
CA Tiger Salamander
15488
Spiny-Sepaled Button-Celery
15486
Spiny-Sepaled Button-Celery
Low Density
V.P.
15549
CA Tiger Salamander
15616
CA Tiger Salamander
40382
Spiny-Sepaled Button-Celery
15552
CA Tiger Salamander
63
15559
CA Tiger Salamander
25080
Spiny-Sepaled Button-Celery
15628
CA Tiger Salamander
15551
CA Tiger Salamander
Med Density
V.P.
Orange Cove
Conservation Planning GIS
San Joaquin Valley and
Southern Sierra Region
N

ATTACHMENT D

From 1/15/92 letter to the USFWS from Mark Jennings, Marc Hayes + Dave Holland.

AGENCY USE ONLY - NOT FOR PUBLIC DISTRIBUTION

... RECORDS FOR Rana aurora draytonii IN CALIFORNIA

ACRONYM	NUMBER	COUNTY	LOCALITY	COLL. DATE
LIT. CIT.	—	Contra Costa	Stock pond 1.25 mi S of dam site	1980?
LIT. CIT.	—	Contra Costa	Stock pond 2 mi S of dam site	1980?
LIT. CIT.	—	Contra Costa	Stock pond 2 mi SSE of dam site	1980?
LIT. CIT.	—	Contra Costa	Stock pond 2.25 mi S of dam site	1980?
KU	0023113	Contra Costa	Berkeley, Wildcat Canyon (Tilden Park)	1944/05/13
FIELD NOTES	—	Contra Costa	Brushy Creek upstream from Section 28.	1980/10/23
SIGHTING	—	Contra Costa	Wildcat Canyon Rd, 400 mi E of Inspiration Point	1968/04/20
SIGHTING	—	Contra Costa	Wildcat Canyon Rd, 400 m E of Inspiration Point	1970/02/07
SIGHTING	—	Contra Costa	Wildcat Canyon Rd, 400 m E of Inspiration Point	1970/02/13
FIELD NOTES	—	El Dorado	S Fk Weber Crk at Snows Rd bridge (2 mi S Camino)	1975/08/01
FIELD NOTES	—	El Dorado	N Fk Weber Crk at Snows Rd bridge (1 mi S Camino)	1975/08/01
FIELD NOTES	—	El Dorado	N Fk Weber Crk at Snows Rd bridge (1 mi S Camino)	1975/08/06
FIELD NOTES	—	El Dorado	N Fk Weber Crk at Snows Rd bridge (1 mi S Camino)	1975/08/11
FIELD NOTES	—	El Dorado	Traverse Cr at Traverse Cr Rd/1 mi NE Spanish Flat	1975/08/14
MVZ	0019057	El Dorado	1 mi SE of Placerville	1935/05/21
MVZ	0019058	El Dorado	1 mi SE of Placerville	1935/05/22
MVZ	0019059	El Dorado	1 mi SE of Placerville	1935/05/22
MVZ	0019060	El Dorado	1 mi SE of Placerville	1935/05/22
CSUS	000281a	El Dorado	Weber Crk, 0.25-0.50 mi above Hwy 50 (at Forni Rd)	1957/03/16
CSUS	000281b	El Dorado	Weber Crk, 0.25-0.50 mi above Hwy 50 (at Forni Rd)	1957/03/16
	000281c	El Dorado	Weber Crk, 0.25-0.50 mi above Hwy 50 (at Forni Rd)	1957/03/16
	000281d	El Dorado	Weber Crk, 0.25-0.50 mi above Hwy 50 (at Forni Rd)	1957/03/16
SIGHTING	—	El Dorado	Creek at jct of Silva Valley & Tong Roads	1987/04/05
MVZ	0006211	Fresno	Minkler (= in Byrd Slough)	1916/10/07
LIT. CIT.	—	Fresno	Sampson Flats, 7 mi N of Dunlap	1924/01/13
LIT. CIT.	—	Fresno	Drainage ditch on level near Fresno.	1942/04/22
MVZ	0077978	Fresno	[Mercy Crk Canyon] 3 mi N[W] of Mercy Hot Springs	1963/08/10
MVZ	0077979	Fresno	[Mercy Crk Canyon] 3 mi N[W] of Mercy Hot Springs	1963/08/10
MVZ	0077980	Fresno	[Mercy Crk Canyon] 3 mi N[W] of Mercy Hot Springs	1963/08/10
MVZ	0077981	Fresno	[Mercy Crk Canyon] 3 mi N[W] of Mercy Hot Springs	1963/08/10
MVZ	0077982	Fresno	[Mercy Crk Canyon] 3 mi N[W] of Mercy Hot Springs	1963/08/10
MVZ	0077983	Fresno	[Mercy Crk Canyon] 3 mi N[W] of Mercy Hot Springs	1963/08/10
SIGHTING	—	Fresno	Little Panoche Creek at Little Panoche Rd	1978/00/00
SIGHTING	—	Fresno	Little Panoche Cr, 4.6 mi W Litte Panoche Det Area	1978/00/00
FIELD NOTES	—	Fresno	Roadside pool at Jamesan (next to Hwy 180)	1938/07/24
FIELD NOTES	—	Fresno	Little Panoche Crk Rd, 4.5 mi NE Fresno-SB Co line	1984/07/21
MVZ	0076576	Glenn	Hwy 162, 2.5 mi E of Elk Creek	1964/10/10
USNM	0003366	Kern	El Paso Creek	1853/09/00
USNM	0003376	Kern	El Paso Creek	1853/09/00
USNM	0008700	Kern	Mts near Ft Tejon (=probably Pastoria Crk)	1875/08/00
UCD	0003384	Kern	Mouth of Kern River, Buena Vista Lake	1931/06/13
SIGHTING	—	Kern	Bakersfield, near Santa Fe Ice House, Jastro Park	1919-1928
LIT. CIT.	—	Kern	Bakersfield	1931/03/06
LIT. CIT.	—	Kern	Stream near Bakersfield	1931/03/24
LIT. CIT.	—	Kern	Irrigation ditch near Bakersfield	1931/03/10
FIELD NOTES	—	Kern	Annette Rd pond, 3.3 mi SW Hwy 46	1972/04/26
SIGHTING	—	Kern	Farm pond on hill, 200 yds E of Spring Pond	1975/08/19
SIGHTING	—	Kern	Section 32 south of the Kern Natl Wildlife Refuge	1981/06-09/00
SIGHTING	—	Kern	Cedar Crk, ca 2 mi SE Glennville on White Mill Rd	1988/06/
FIELD NOTES	—	Kern	Pond S side Hwy 41, 2.45 mi SW Kern-Kings Co line	1983/02/26
FIELD NOTES	—	Kern	S side of Hwy 41, 2.70 mi S of Kern-SLO Co line	1983/02/26

FAX TRANSMISSION

U.S. FISH AND WILDLIFE SERVICE
2800 COTTAGE WAY, ROOM W-2605
SACRAMENTO, CALIFORNIA 95825
PHONE: (916) 414-6575
FAX: (916) 414-6712 or 6713

TO: Jeff Halstead

FAX #: 559-237-5560

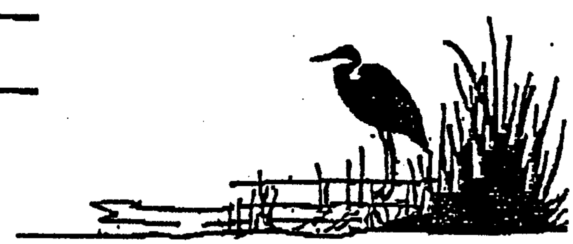
FROM: CAROLINE PROSE

DATE: 10/4/01

PAGES: 2 **, including this cover sheet**

SUBJECT: Locality Records for the red-legged frog for Fresno County.

COMMENTS:



ATTACHMENT E

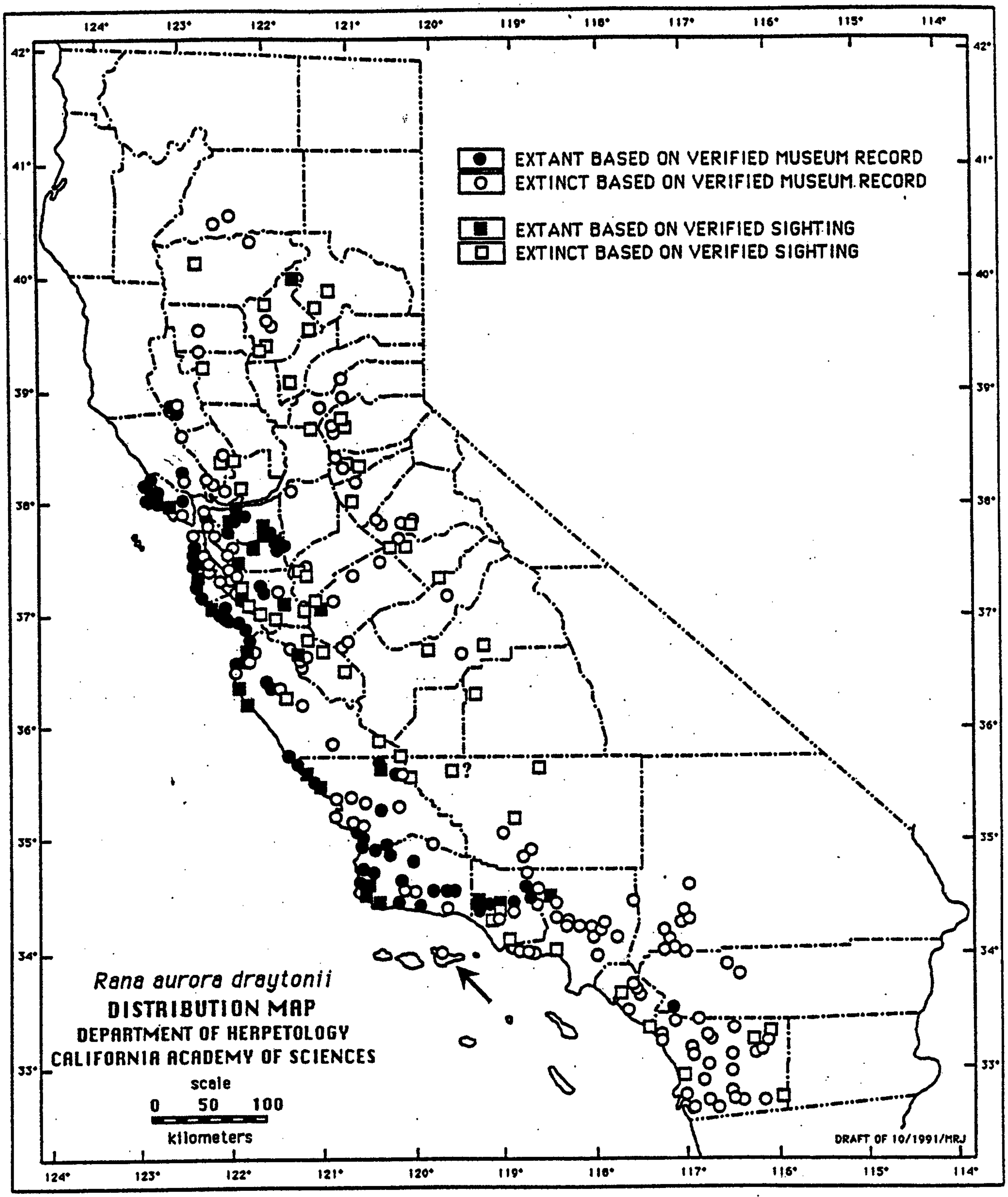


Figure 17. Historic and current distribution of the California red-legged frog (*Rana aurora draytonii*) in California based on 762 locations from 1229 museum records and 291 records from other sources.

AMPHIBIAN AND REPTILE SPECIES OF SPECIAL CONCERN IN CALIFORNIA

Mark R. Jennings
Research Associate
Department of Herpetology, California Academy of Sciences
Golden Gate Park, San Francisco, CA 94118-9961
and
Marc P. Hayes
Research Associate
Department of Biology, Portland State University
P.O. Box 751, Portland, OR 97207-0751
and
Research Section, Animal Management Division, Metro Washington Park Zoo
4001 Canyon Road, Portland, OR 97221-2799

The California Department of Fish and Game commissioned this study as part of the Inland Fisheries Division Endangered Species Project. Specific recommendations from this study and in this report are made as options by the authors for the Department to consider. These recommendations do not necessarily represent the findings, opinions, or policies of the Department.

FINAL REPORT SUBMITTED TO
THE CALIFORNIA DEPARTMENT OF FISH AND GAME
INLAND FISHERIES DIVISION
1701 NIMBUS ROAD
RANCHO CORDOVA, CA 95701
UNDER CONTRACT NUMBER 8023

1994

ATTACHMENT F

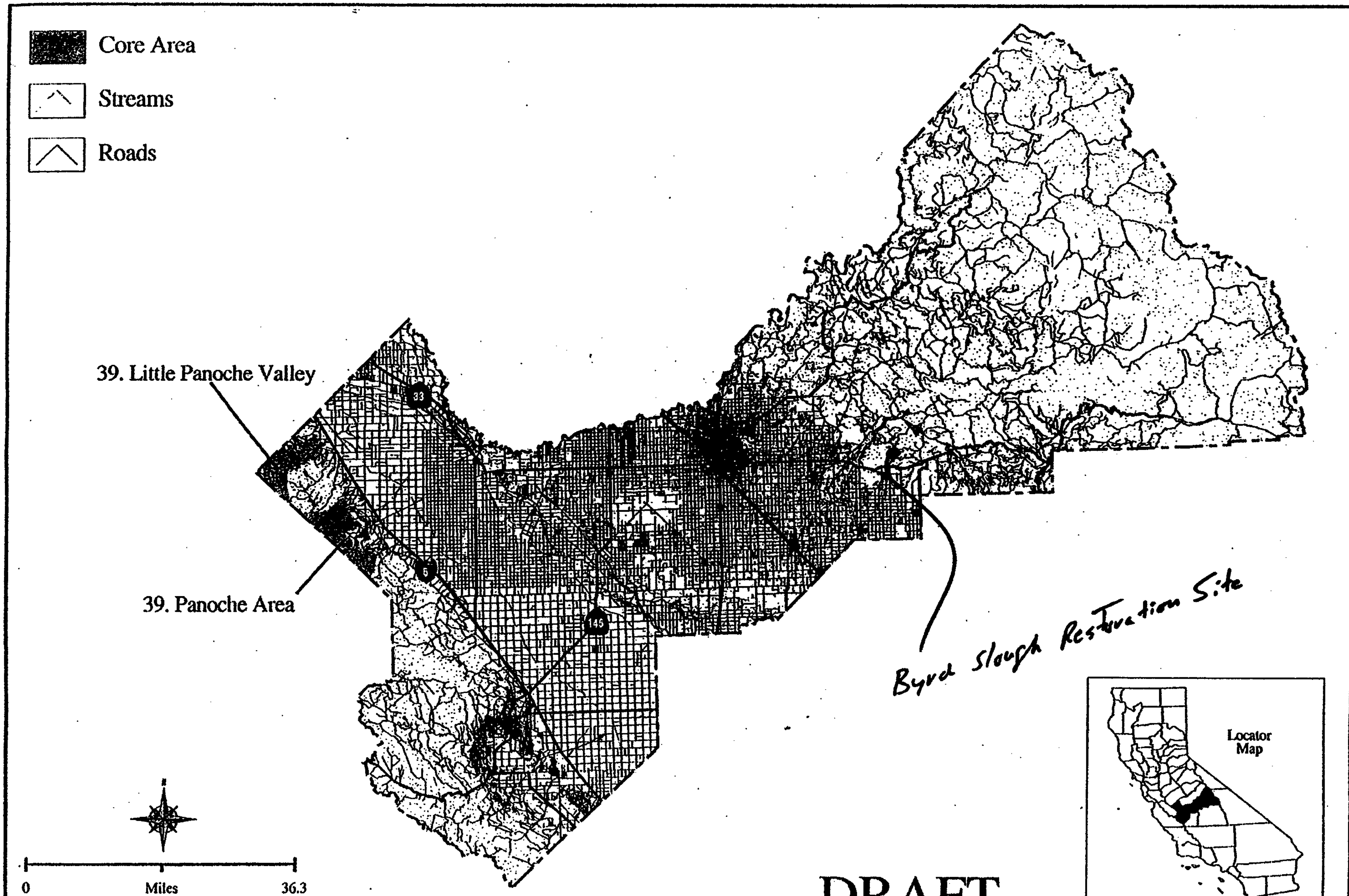


Figure 37. Core areas in Fresno County.

DRAFT RECOVERY PLAN

For the

CALIFORNIA RED-LEGGED FROG
(*Rana aurora draytonii*)

(January 2000)

Region 1

U.S. Fish and Wildlife Service

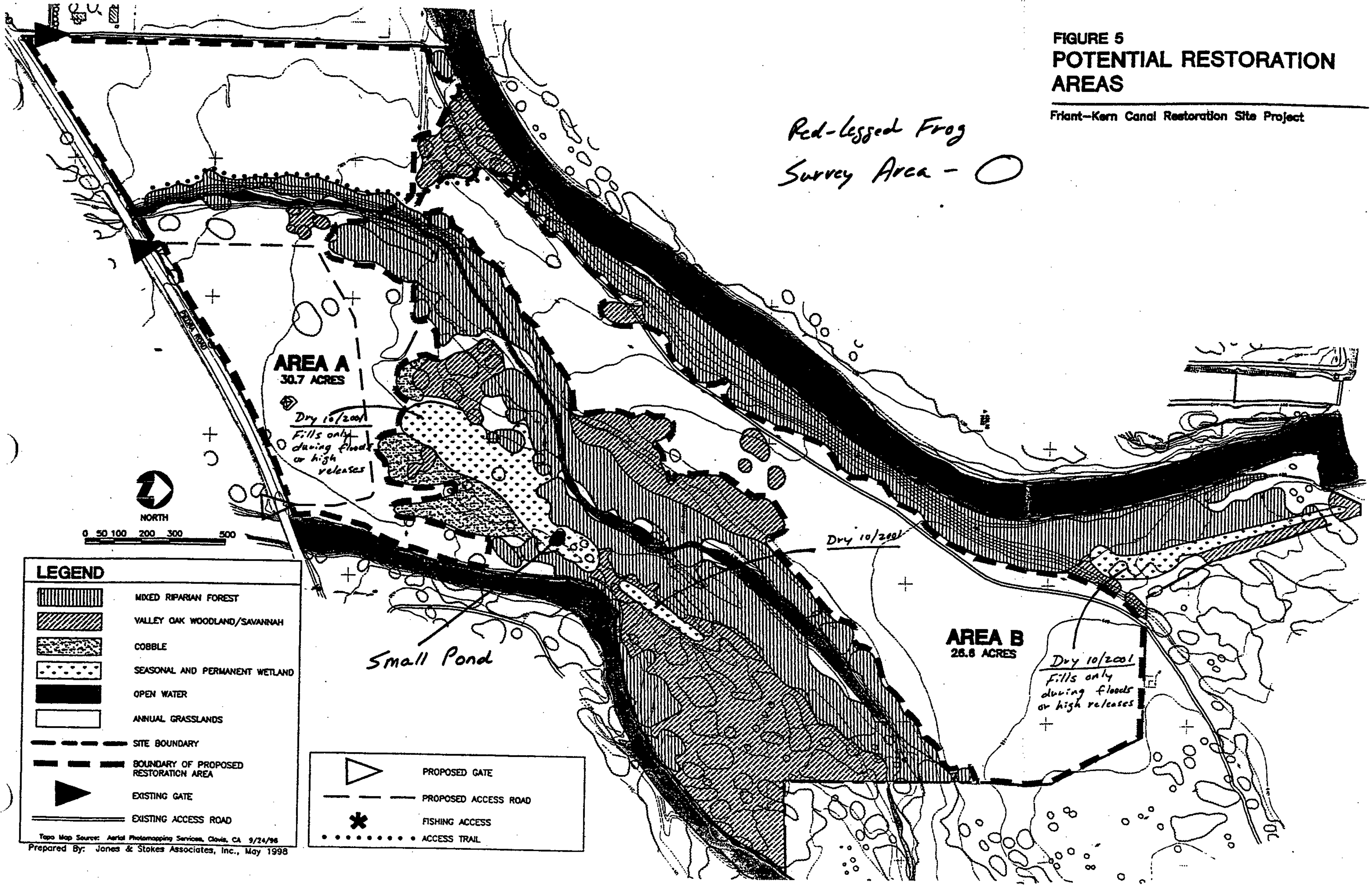
Portland, Oregon

Approved: XXXXXXXXXXXXXXXXXX
Manager, California/Nevada Operations Office
Region 1, U.S. Fish and Wildlife Service

ATTACHMENT G

FIGURE 5
POTENTIAL RESTORATION AREAS

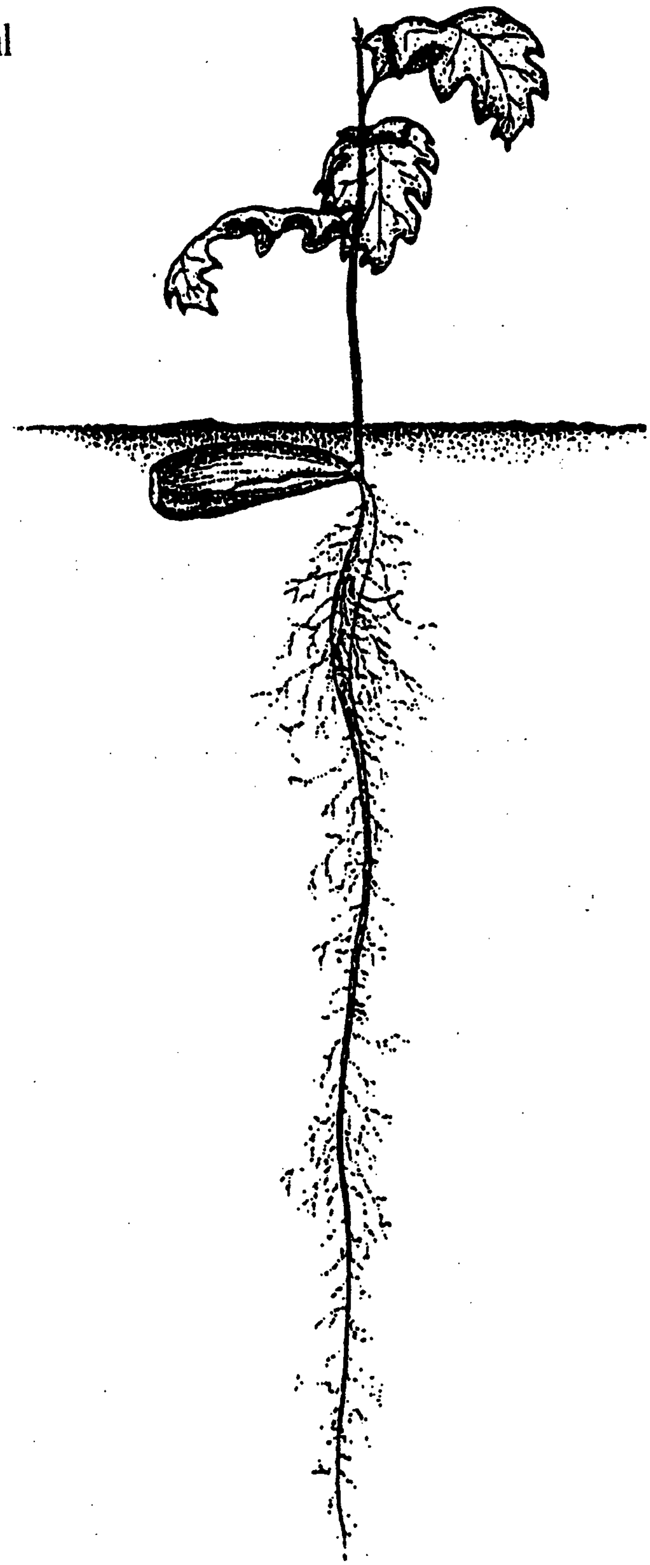
Friant–Kern Canal Restoration Site Project



Friant-Kern Canal Restoration Site

Fresno County, California

Site Conditions and Conceptual Alternatives for Restoration



Prepared for:

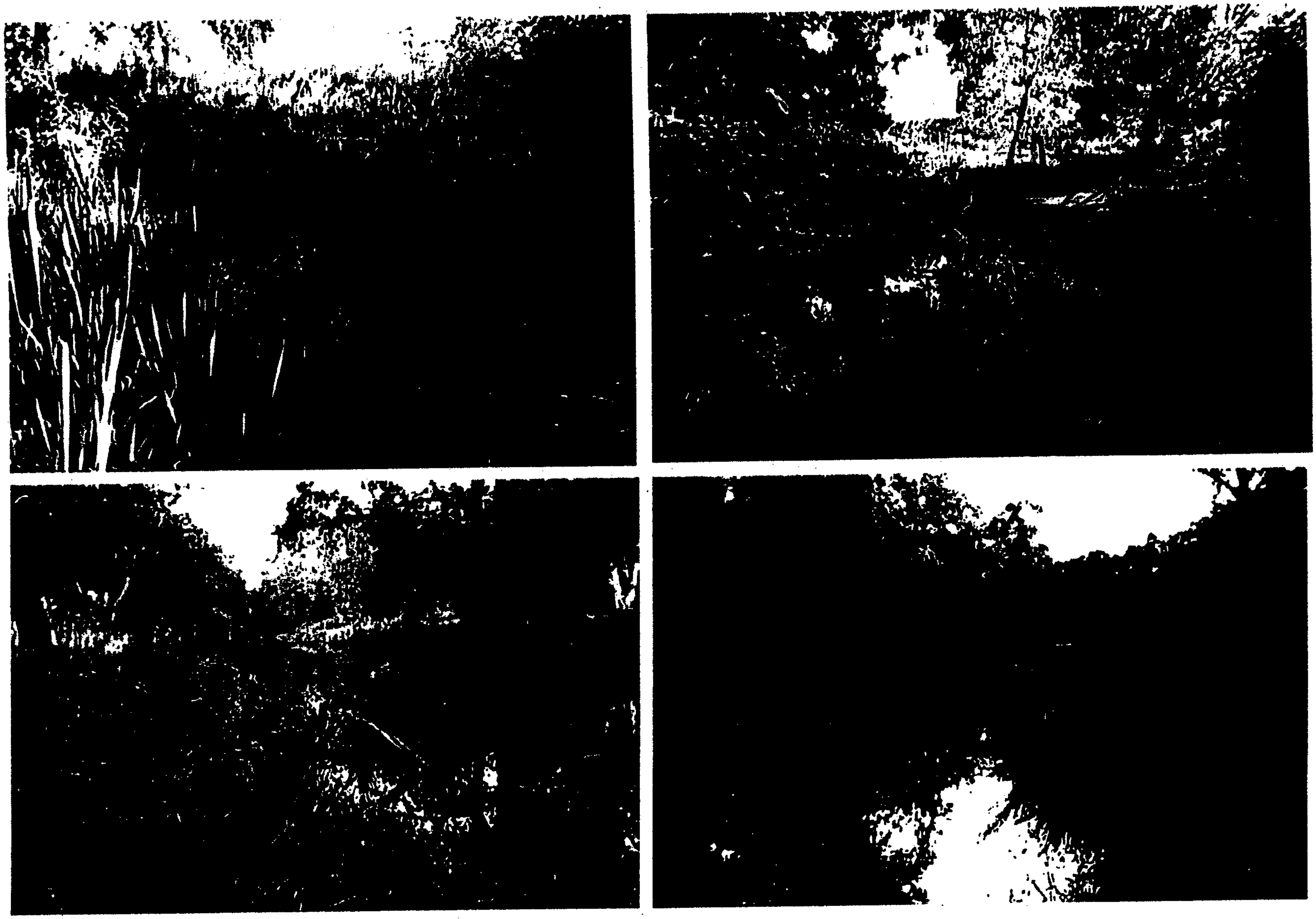
U.S. Army Corps of Engineers
Sacramento District
Environmental Resources Branch
1325 J Street
Sacramento, California 95814
Contact: Patricia Roberson
916/557-6705

Prepared for:

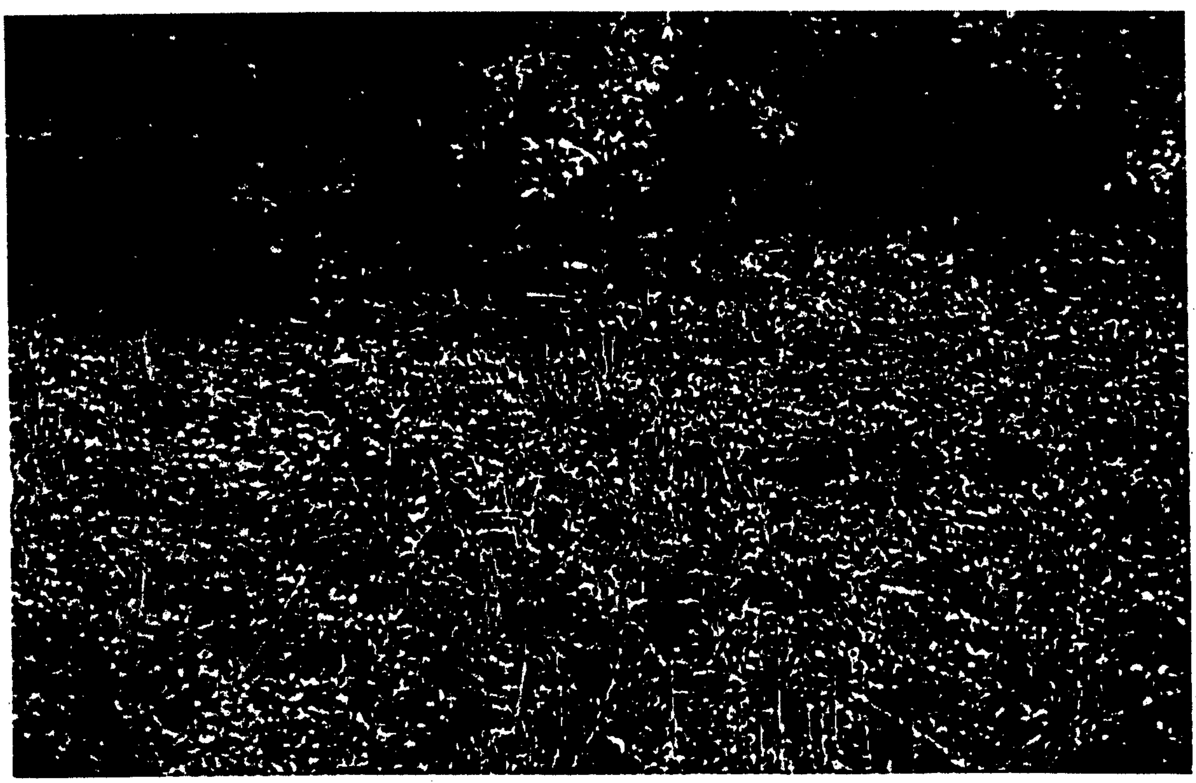
Jones & Stokes Associates, Inc.
2600 V Street, Suite 100
Sacramento, California 95818
Contact: Amy Rucker and Judy Boshoven
916/737-3000

August 1998

ATTACHMENT H

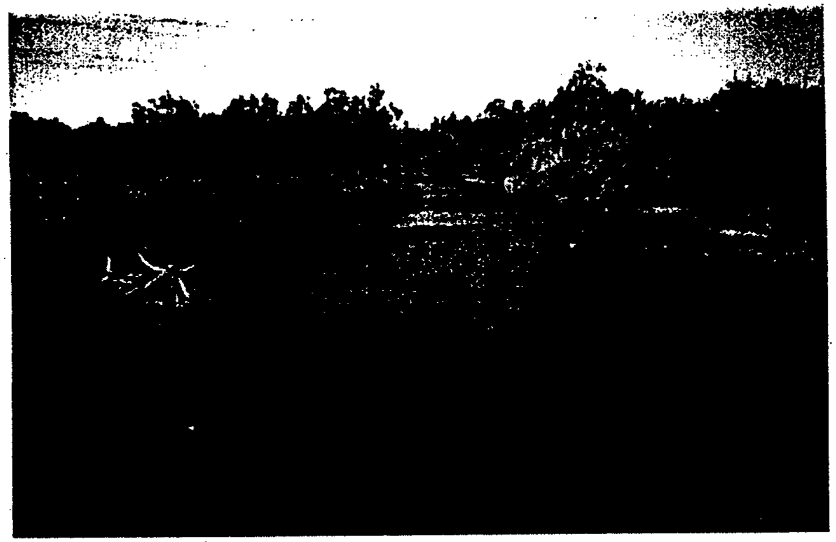


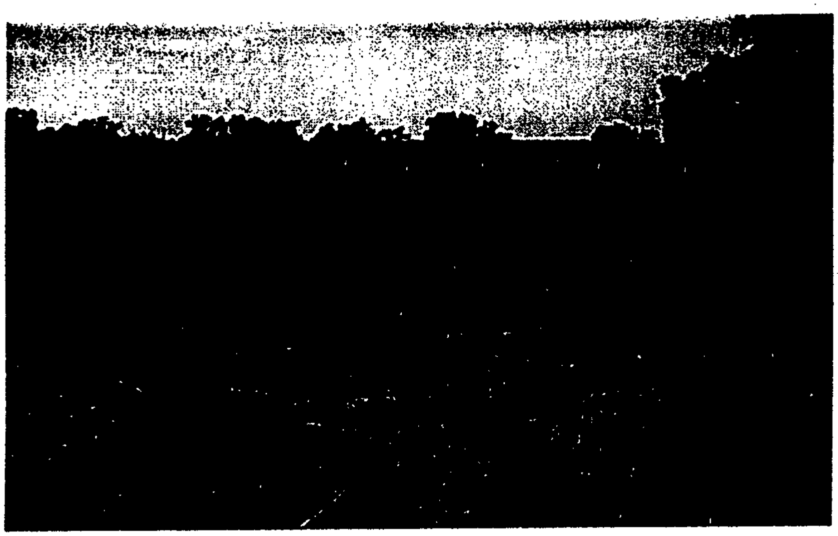
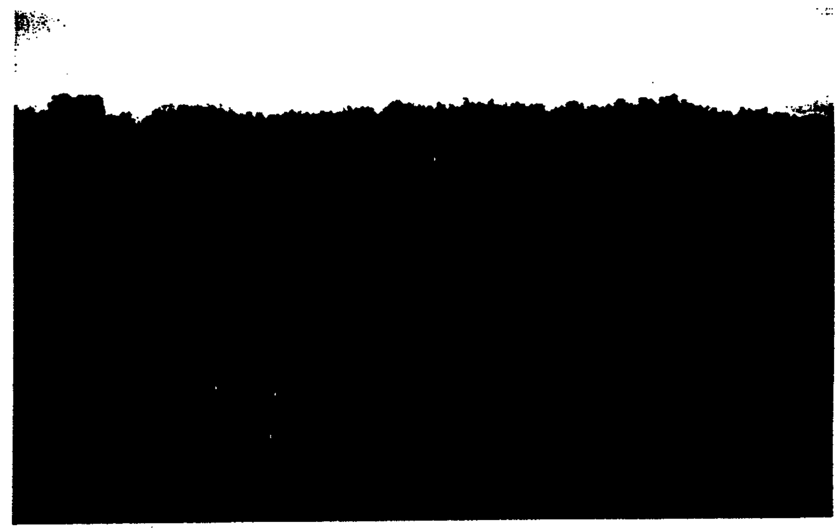
Byrd Slough near the Kings River (Fresno County, California), October 2001.



Small pond on the Byrd Slough Habitat Restoration Site (Fresno County, California).
Photographs taken October 10, 2001

ATTACHMENT I



Byrd Slough Habitat Restoration Site, October 2001.
Upper left - Alta Main Canal. Upper right - Kings River. Lower left and right- Valley Oak and riparian Restoration Area.

APPENDIX D

CORRESPONDENCE WITH THE NATURAL RESOURCES CONSERVATION SERVICE

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

1/18/2000

REPLY TO
ATTENTION OF

December 8, 1999

Ms. Giglio,
We are sorry for the delay in the request for a Farmland Conversion Impact Rating. If you have any questions, please contact me @ (559) 276-7494 ext.
Thank you,
Carolyn LoFreso
NRCS- Fresno

Environmental Resources Branch

Mr. Frank Menezes
U.S. Department of Agriculture
Natural Resources Conservation Service
Fresno Field Office
4625 W. Jennifer. Suite 125
Fresno, California 93722

Dear Mr. Menezes:

Re: We are requesting the Farmland Conversion Impact Rating for the Pine Flat Fish and Wildlife Habitat Restoration study. The goal of this study is to restore fish and wildlife habitat along the lower Kings River in Fresno County. The proposed alternatives include installing a multilevel intake structure at Pine Flat Dam, restoring 122 acres near the Friant-Kern Canal siphon, and constructing 10.6 miles of pipeline along existing roadways from the Dry Creek Canal to the James Bypass flood channel. Enclosures 1 through 3 are a description of the alternative plans, maps, and a farmland conversion impact rating form.

The alternatives would not significantly affect existing land uses in the study area. No farmland would be used to install the intake structure at the dam site. Although areas of agricultural land at the Friant-Kern Canal restoration site and the pipeline alignment would be temporarily affected during construction, no agricultural land would be permanently removed from production or converted to another use. We have identified these areas on the enclosed maps for your inspection and analysis.

We would appreciate a reply within 30 days. If you have any questions, please contact Ms. Deborah Giglio, Environmental Planner, at (916) 557-5195.

Sincerely,

Mark Capik

Mark Capik
Acting Chief, Planning Division

Enclosures

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request: December 8, 1999
Name Of Project: ...NE FLAT FISH AND WILDLIFE HABITAT RESTORATION	Federal Agency Involved: U.S ARMY CORPS OF ENGINEERS
Proposed Land Use:	County And State: FRESNO COUNTY, CALIFORNIA
PART II *(To be completed by SCS)*	Date Request Received By SCS:
Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply — do not complete additional parts of this form)* Yes ☐ No ☒	Acres Irrigated: 1,297,400 / Average Farm Size: 280 acres
Major Crop(s): Cotton, grapes, tomatoes / Farmable Land In Govt. Jurisdiction: Acres: 1,298,700 % 34	Amount Of Farmland As Defined in FPPA: Acres: Data N/A %
Name Of Land Evaluation System Used: California Storie System / Name Of Local Site Assessment System:	Date Land Evaluation Returned By SCS: 1/18/2000 CJ.

PART III *(To be completed by Federal Agency)*	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	30.7	36.6		
B. Total Acres To Be Converted Indirectly			83.21	
C. Total Acres In Site				

PART IV *(To be completed by SCS)* Land Evaluation Information	Site A	Site B	Site C	Site D
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b))*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or a local site assessment)*	160				
TOTAL POINTS *(Total of above 2 lines)*	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

83.21 Acres along the Water Transfer Pipeline

The spoil area for the 155,000 cubic yards of material will be determined at a future date prior to construction of the water transfer pipeline as per discussion with local sponsor, KRCD, 12/6/99.

Encl 3

APPENDIX E

CORRESPONDENCE WITH THE STATE HISTORIC PRESERVATION OFFICER

STATE OF CALIFORNIA – THE RESOURCES AGENCY

GRAY DAVIS, Governor

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 942896
RAMENTO, CA 94296-0001
-6624 Fax: (916) 653-9824
mail2.quiknet.com

April 2, 1999

Refer To: COE990322A

Mr. Walter Yep
Chief, Planning Division
DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Re: Pine Flat Dam Fish and Wildlife Habitat Restoration Project, Fresno County, CA.

Dear Mr. Yep:

You have made the following determination about the undertaking cited above:

A. [X] There are no historic properties that may be affected by the undertaking.

B. [ ] The undertaking will not affect historic properties.

I am unable to comment on your determination in a timely manner. Therefore, 36 CFR 800.4(c)(5) and 36 CFR 800.4(d) apply to Item A., above, and 36 CFR 800.5(b) applies to Item B., above.

Sincerely,

Daniel Abeyta

Daniel Abeyta, Acting
State Historic Preservation Officer

March 18, 1999

Environmental Resources Branch

Mr. Daniel Abeyta
Deputy State Historic Preservation Officer
Office of Historic Preservation
California State Department of Parks and Recreation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Abeyta:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800, we are requesting your review and comments on the proposed Pine Flat Dam Fish and Wildlife Habitat Restoration Project, California. A multilevel intake structure would be constructed on the upstream face of Pine Flat Dam on the Kings River, Fresno County. A 120-acre parcel of land between the Kings River, to the northwest, and the Alta Main Canal, to the southeast, would be obtained for a riparian habitat restoration site. A water transfer pipeline 10.6 miles long would carry excess water from King's River North over to the Mendota Pool. The enclosed letter report details the project elements and our cultural resources investigations

We have determined that there are no potentially eligible, eligible, or listed properties on the National Register of Historic Places that would be affected by construction of the project features. We have applied the criteria for evaluating resources to the National Register of Historic Places and have determined that there are no properties that have made a significant contribution to the broad patterns of our history and none are associated with the lives of persons significant in our past. Pine Flat Dam is of common material and design and does not represent distinctive characteristics of type, period, or method of construction. It does not exhibit particular technological advances. The field examination of the habitat restoration area revealed little of the former residence and barn as they had been completely removed. Only a little concrete debris remained. The ground was quite disturbed and there appeared to be negligible archeological potential. Archival research has failed to disclose evidence that this property was associated with any important individuals or events at any time. Alignment of the water transfer pipeline closely parallels existing paved roads and there is no indication that cultural resources are present. The potential for buried archeological sites in this area is minimal. Therefore, we have concluded that the project would have no effect on historic properties. If you have any questions, please contact our District archeologists, Patti Johnson at (916) 557-6611 or Elizabeth Salsedo at (916) 557-6754.

Sincerely,

Walter Yep

JOHNSON
CLARK
YEP

Enclosures

-PD
-R (Johnson, Giglio)

APPENDIX F

COMMENTS AND RESPONSES TO PUBLIC REVIEW

CONTENTS

INTRODUCTION

The draft Feasibility Report (FR) and draft Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) was completed and distributed for public review and comment in July 2001. This appendix contains the comments that were received during the review period, which ended on September 20, 2001, as well as the responses to those comments. Lengthy comments are summarized or partially quoted. When the same comment is made by several commentors, the response is given once and then subsequently referred to. Copies of the original correspondence are included after the comments and responses.

All responses can be considered as part of the final FR and EIS/EIR. The Corps and non-Federal sponsor wish to thank the commentors for taking the time and effort to participate in the public review process.

FEDERAL AGENCIES

1. Letter from U.S. Environmental Protection Agency dated August 28, 2001.

Comment 1.1: "The DEIS (pp. 2-15, 4-14) indicates that a water quality monitoring program would be implemented during construction of the project. The FEIS should describe the monitoring program; specifically, the FEIS should identify the parameters to be monitored, sampling frequencies, action levels, oversight responsibilities, and measures to be taken if action levels are exceeded."

Response: *A water quality monitoring program will be prepared during the pre-construction engineering and design phase of this project. Based on engineering and design specifications, a detailed monitoring program will be established, including water testing and laboratory analysis to ensure that water quality levels do not exceed standards set by the U.S. Environmental Protection Agency and the State Regional Water Quality Control Board.*

Comment 1.2: "The DEIS mentions a 2.07 acre staging area near the dam and a one-acre staging area near Byrd Slough, which would be used during the proposed construction activities. The FEIS should describe the staging area sites that would be used both at the dam and near Byrd Slough, and discuss the best management practices that would be used there to prevent impacts to water quality."

Response: *The 2.07-acre staging area near the dam would be the existing paved parking area at the south abutment of the dam. The 1-acre staging area near Byrd Slough is located in an open grassland area within the restoration site. Both staging areas are at least 100 yards from any waterway. As a result, there is expected to be a less-than-significant effect to water quality. Fencing would be used to delineate the staging area boundary within the Byrd Slough restoration site. The EIS/EIR will be modified to include a more detailed description of the staging areas, as well as plates (maps) showing their locations.*

Comment 1.3: "...specific avoidance measures for special status wildlife species such as bald eagle or Swainson's hawk are not described. The FEIS should discuss whether avoidance measures would be needed during breeding or nesting season or whether the Byrd Slough staging area would be required to be a minimum distance from active nests. The FEIS should describe any such measures."

Response: *Prior to any work being performed, pre-construction surveys for bald eagles and Swainson's hawks will be conducted. Based on the results of the surveys, specific avoidance and minimization measures will be developed and implemented to reduce any potential adverse effects to less than significant. Currently, there are no recent documented sightings of active breeding nest sites at Pine Flat Reservoir or along the lower Kings River. The critical breeding period for bald eagles is from January 31 through June 15. However, there have been documented sightings of bald eagles at Pine Flat Reservoir during their critical wintering period, which extends from November 15 through March 15. The minimum distances for construction activities from active nest and roost sites would vary depending on type of activity and visual proximity, but would usually range from 400 to 800 meters.*

Comment 1.4: "The FEIS should indicate whether irrigation is expected to be needed beyond the first three to five years of vegetation establishment. If so, who would maintain it? Would it be used in dry years? If not, would it be decommissioned?"

Response: *No irrigation is anticipated beyond the 3-year establishment period. The groundwater table and sloping drainage towards the Kings River should be sufficient to sustain the planted riparian species beyond the initial establishment period. The EIS/EIR will be modified accordingly to state that no supplemental irrigation will be required beyond the initial establishment of riparian species.*

2. Letter from U.S. Department of the Interior, Office of the Secretary, dated August 31, 2001.

Comment 2.1: The U.S. Department of the Interior had received and reviewed the document and has no comments.

Response: *We appreciate the Department of Interior's time and consideration in reviewing this document.*

STATE AGENCIES

3. Letter from the California State Lands Commission dated October 10, 2001.

Comment 3.1: Although the California State Lands Commission (CSLC) submitted comments after September 20, 2001, they essentially provided the CSLC's jurisdictional limits with regard to the project proposal. The letter states: "To the extent there is water in the slough, it is subject to a public navigational easement. This easement provides that members of

the public have the right to navigate and exercise the incidences of navigation in a lawful manner on State waters that are capable of being physically navigated by oar or motor-propelled small craft. Such uses may include, but not be limited to, boating, rafting, sailing, rowing, fishing, fowling, bathing, skiing, and other water-related public uses."

Response: *The current project proposal will not involve any work within a waterway subject to jurisdiction by the CSLC. If it is later determined that work may occur within the CSLC's jurisdiction, the Corps will coordinate with them and address any potential concerns at that time.*

4. Letter from California Department of Water Resources dated July 24, 2001.

Comment 4.1: "Portions of the proposed project are located within the Kings River designated floodway (Piedra to Pine Flat Dam) over which The Reclamation Board has jurisdiction and exercises authority. Section 8710 of the California Water Code requires that a Board permit must be obtained prior to start of any work, including excavation and construction activities, within floodways, levees, and 10 feet landward of the landside levee toes."

Response: *Prior to the start of any work, any and all applicable permits and authorizations will be applied for and secured.*

LOCAL AGENCIES

5. Letter from the County of Fresno dated September 20, 2001.

Comment 5.1: "...the habitat restoration project assumes that the 143-acre County-owned Kings River Greenbelt Undeveloped Park will be acquired by the Kings River Conservation District. This matter has not been formally presented to the Board of Supervisors."

Response: *KRCD has discussed use of a long-term conservation easement with the Corps and County staff, and prefers to use this approach.*

The Corps staff in Washington DC required the KRCD (local agency) to first consider the "Purchase of the Property" and mandated such wording in the draft Feasibility Report and EIS/EIR. The KRCD and Sacramento District will pursue obtaining a conservation easement for the restoration site instead of acquiring the land in fee simple title. Text addressing the conservation easement that was included in previous drafts of the project documents will be put back into the final EIS/EIR, Feasibility Report, and

Real Estate Plan.

Comment 5.2: "...stated in numerous places throughout the two documents is the decline and degradation of riparian and shaded riverine aquatic (SRA) habitat due to continual cattle grazing at the Kings River Greenbelt Undeveloped Park (Byrd Slough) site. These statements are used as the underlying basis for the restoration proposal. Fresno County terminated its grazing lease in August 1995 and grazing has not occurred for the past six years. The EIS/EIR also fails to acknowledge prior oak tree revegetation activities and the installation of wildlife habitat structures by the Kings River Conservation District, which have occurred since the grazing ceased."

Response: *The County's cattle grazing leases may have ceased in 1995, but the site was still heavily grazed by stray cattle held by the County's Sheriff Department through spring 1997. The KRCD, in cooperation with the County, conducted an experimental oak planting test on the site in March 1997, which was partially destroyed by cattle.*

Field studies for the EIS/EIR were conducted in summer 1997. At that time, cattle grazing had severely degraded the site. Statements in the June 2001 draft document reflect conditions when the field study was conducted in 1997. The 1997 conditions affect the project assumptions, predicted conditions, and project benefits. Although no cattle have grazed the parcel since 1997, it is not practical to redo the hundreds of hours of field work and analyses conducted by the U.S. Fish and Wildlife Service, Corps, and KRCD.

Comment 5.3: "An additional misleading statement is the reference to potential urban development of the Byrd Slough site. The subject property is designated Open Space, Floodway, and Agriculture in the Kings River Regional Plan and is in public ownership (Fresno County) and therefore references to potential urban development of the site are misleading."

Response: *Any references to urban development of the restoration site will be removed from the EIS/EIR.*

Comment 5.4: "If the site is acquired, the impact of the loss of 143 acres of County parkland and its recreational opportunities must be assessed. Mitigation measures for these impacts should be identified including assurances for future public access to the site and the river. The EIS/EIR must include details for use of the site before, during and after the three to five year restoration period to enable an adequate assessment of this impact."

Response: The *EIS/EIR recognized that acquisition of the Byrd Slough property in fee simple title has not been acted upon by the County Board of Supervisors. The County Board of Supervisors indicated at their hearing conducted on September 18, 2001, that they are not interested in selling the property, but a long-term conservation easement may be acceptable. The conservation easement would address many of the County concerns including loss of parkland, recreational opportunities, and public access.*

Comment 5.5: "The EIS/EIR does not adequately address alternatives to the habitat restoration project." "...the discussion and analysis of alternatives should be expanded to include alternate restoration sites."

Response: *Under NEPA, Section 1502.14: Alternatives including the proposed action (exact text); agencies shall "(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated."*

Under CEQA Guidelines Section 15126.6 (a): An EIR shall describe a range of reasonable alternatives to the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project. When a project will not result in significant unavoidable effects, it is not required that alternative sites be considered. Restoration of the Byrd Slough site would not result in any significant effects, so alternative sites are not required to be considered.

Three other potential restoration sites (Westlake Farms, Avocado Side Channel Slough, and Bureau of Reclamation property) were evaluated as measures during the plan formulation process. It was determined that the Westlake Farms lacked an available surplus surface water supply and was too far from the project area. The Bureau would continue to actively plan and develop a restoration project on their property as part of a separate project. The Avocado Side Channel Slough would be pursued as a separate Corps Section 1135 project. These were determined not to be reasonable alternatives to this project, and they were eliminated from detailed study. The reasons for elimination of the Westlake Farms and Avocado Side Channel Slough are discussed in the EIS/EIR. Although the Bureau property was not an alternative considered, a brief discussion has been added to the EIS/EIR.

Comment 5.6: There are three issues related to flood water management and potential impacts to downstream properties that need to be addressed.
How will the reservoir's normal use for flood control during and after the construction phase be affected?"

Response: *Specific congressional direction for the study states in part: "The study will be conducted in close coordination with local water rights holders and will take into account existing agreements governing the operation of the Kings River. The study will not propose actions that would (1) interfere with existing Kings River water rights, storage rights or operations or (2) require any involuntary acquisition of water rights, storage rights or land."*

The multilevel intake structure will not modify the amount of water released from the reservoir, but will allow selective withdrawal of water from various levels within the reservoir.

Comment 5.7: "Will there be any modification to emergency response and notification procedures as a result of the project?" Will the risk of flood or dam failure to properties downstream or in the inundation pathway be affected?"

Response: *The multilevel intake structure will be located on the upstream face of the dam and will release water through the existing penstocks. This will not require modification to emergency procedures or increase risk of flood or dam failure. Construction of the multilevel intake structure will be scheduled during low reservoir conditions and will not affect flood control operations. The Byrd Slough restoration site is not located within the designated floodway, and restoration of the site will not increase flooding hazards in the lower Kings River.*

6. Letter from the Kings River Water Association dated September 18, 2001.

Comment 6.1: "The Draft Feasibility Report describes the Kings River Fisheries Management Program under the Framework Agreement (the Program). That Program superceded, in its entirety, the 1964 agreement between the Department of Fish and Game and the KRWA. As such it already provides substantial benefits over historic conditions, which should be noted in the EIS/EIR."

Response: *The EIS/EIR addresses the role of the Kings River Fisheries Management Program under the Framework Agreement in Section 5.1.2, Related Projects in the Study Area.*

Comment 6.2: "We strongly suggest that during the final design of the project, that additional years representing a broader range of hydrological conditions be analyzed so that the full benefits of a multi-level intake structure can be understood. Further, it is not clear whether the stated benefits of a multi-level intake structure are based on a comparison to the

average of the baseline years of 1988, 1992 and 1994, or are based on a weighing of the long-term distribution of runoff. That point should be clarified."

Response: *The selection of the most recent critically dry, wet, and below average years for which data was available adequately represents the range of water conditions to evaluate the range of possibilities for modeling management of water temperatures to develop the range of benefits. The temperature model study performed by KRCD states: "... Meteorological data sets were created for 1988, 1989, 1992, 1993 and 1994. Whenever possible, data was used from the KRCD weather station located at the Kings River Powerhouse.... The CE-QUAL-W2 model has been calibrated for years 1988, 1989, 1992, 1993 and 1994. The first three years were critically dry, 1993 was the 10th wettest year on record and 1994 was considered a below average year. Classification of years as dry, wet or average (for modeling purposes) does not necessarily refer to the amount of rainfall, but more so to the combination of rainfall and storage in the reservoir throughout the year. For this study we used years 1992, 1993 and 1994 to model since they provided a broad range of storage and flow characteristics. ..." The benefits are based on the average of the Weighted Usable Area (WUA) of the years 1988, 1992, and 1994. The average benefit was calculated by multiplying the values by the frequency of those year types over the long-term record. The frequency of occurrence of dry, critically dry, and normal water years are 16, 7, and 53 percent, respectively.*

Comment 6.3: "...in certain critically dry years it may not be possible to maintain instream temperatures at acceptable levels with existing facilities. It is expected that a multi-level intake structure would be extremely useful in managing water temperatures in those critically dry years." "We wonder whether other assumptions about desired temperatures should also be modeled to permit a fuller understanding of the benefits of a multi-level intake structure."

Response: *The modeling of desired temperatures was based on maintaining water temperatures required for the survival of native coldwater fisheries. A Corps reservoir temperature model (CE-QUAL-W2) and a U.S. Fish and Wildlife Service river temperature model (SNTEMP) were applied to three alternatives for representative year types (wet, dry, and normal). Benefits were derived using analyzed data from actual flows and river temperatures.*

This methodology used to evaluate benefits associated with the multilevel intake structure is fully described in the U.S. Fish and Wildlife Service Coordination Act Report attached as an appendix to the EIS/EIR.

Comment 6.4: "...we suggest that additional operational studies be conducted to evaluate potential benefits of a multi-level intake structure device operated in concert with the fishery management program under the Framework Agreement, particularly in those extremely dry years such as 1924 and 1977."

Response: *This feasibility study was conducted with the assistance and cooperation of the KRCD, KRWA, and California Department of Fish and Game. The modeling of management of water temperatures with the multilevel intake structure was evaluated in accordance to the Kings River Fisheries Management Program Framework Agreement (May 1999), which was established to balance the fishery needs with other beneficial uses while maintaining established water and storage rights. One of the program elements was to maintain water temperatures from Pine Flat Dam to the Fresno Weir for coldwater fish, which is the principle function of the multilevel intake structure. Regarding water years used for modeling, please refer to the response to comment 6.2.*

ORGANIZATIONS AND INDIVIDUALS

7. Letter from the Fly Fishers for Conservation, Inc., dated September 19, 2001.

Comment 7.1: The Fly Fishers for Conservation have stated "unanimous support" for the multi-level intake structure, and had "no comment" for all other alternatives.

Response: *We appreciate the Fly Fishers time and consideration in reviewing this document.*

8. Letter from Mr. Ted Ruffner dated September 15, 2001.

Comment 8.1: "The document makes over 50 references to cattle being currently grazed on the park or that without the project, grazing will continue. You claim the park is severely degraded, there is no Oak regeneration and that the vegetation understory is sparse, because of cattle grazing. All of these statements are false."

Response: *Please refer to the response to comment 4.2.*

Comment 8.2: Letter from the California Trout organization dated August 27, 2001. The letter states: "If the County sells the property to the Corps access could be denied for many years due to their plans to replant the area and build fences." "...they plan on building cattle fence where fence already exists. In fact, we believe that cattle have not used this area since 1995."

Response: *The local non-Federal sponsor (KRCD) is responsible for providing all lands, easements, rights-of-way, relocations, and disposal areas. The Corps will not purchase the property. As already stated in the draft EIS/EIR on page 2-9: "Public access to the restoration site and the Kings River would be provided...." KRCD will not close the park to the public or deny public access to the river. Fishing access will not be affected. Text from the draft EIS/EIR on page 3-8 states: "Public access would likely be controlled during restoration and management of the Byrd Slough restoration site. However, current use is small, and the effect would be short term." Access restrictions would be temporary, and alternative means of access to the river will be provided at all times.*

Regarding cattle grazing, please refer to the response to comment 4.2.

Comment 8.3: A concern was brought up over the failed attempt by KRCD's experimental plantings of oak saplings within the restoration site. Questions were raised about the actual benefits to be achieved by planting riparian species within the restoration area.

Response: *Test plots of oak trees were planted on the site in 1997 as part of a project to establish protocol for planting native oak acorns in areas where oaks once existed and, through monitoring, to use data as a guide for future restoration projects along the Kings River riparian corridor. It was during this period that the experimental oak planting test was partially destroyed by cattle. The test plots showed that irrigation is needed for successful valley oak initial survival and growth.*

The oak tree planting test in 1997 will not affect the results of the Habitat Evaluation Procedures study by the U.S. Fish and Wildlife Service in 1997 and the benefits of the proposed project.

Comment 8.4: "CEQA and NEPA require you to have meetings with involved parties. There were no meetings with any decision makers from the county. My commission or the Supervisors were not informed or consulted of the important points of proposal before we received the EIR."

Response: *The following excerpt is from the Draft Feasibility Report on page 4: "The reconnaissance phase of the study was initiated in April 1993. On May 13, 1993, a public workshop was held in Fresno. After the workshop, an ad hoc committee was established, composed of representatives from the Corps, U.S. Bureau of Reclamation (Bureau), California Department of Fish and Game (DFG), KRCD, KRWA, Fresno Irrigation District (FID), Lower Kings River Committee, Fresno Flyfishers for Conservation, Clovis Bass Club, Kaweah Flyfishers, landowners around the lake, and marina and whitewater rafting representatives.*

Members of the ad hoc committee participated in identifying problems and potential environmental restoration measures. The committee held four meetings in 1993 and two meetings in early 1994. A reconnaissance report was completed in 1994. A notice of initiation of the feasibility study was circulated in late March 1996, and a notice of intent to prepare a draft EIS/EIR for the Pine Flat restoration study was published in the Federal Register. This notice provided information on the study and encouraged nationwide comment. A public scoping meeting was held in Fresno on April 24, 1996. At the meeting, the public was provided with information on the environmental problems in the Kings River basin, fish and wildlife restoration alternatives, and study process." Mr. Ruffner attended the public scoping meeting in 1996.

Since that time, KRCD has been coordinating with all of the local agencies in Fresno County, providing updates at their monthly Board meetings.

Comment 8.5: "Although there were several proposals listed, there were no other sites studied or mentioned for this project. And there were no explanation on why this site was chosen. This site is misrepresented as not being a park...". "The EIS says there is little use and recreation, false. This is the only fishing access to the river for miles between Avocado Lake Park and Highway 180." "There are numerous Federally owned and other lands along the Kings River closer to the dam that would be much more appropriate for this project. Study alternative sites."

Response: *Please refer to the response to comment 4.5. The final Feasibility Report and EIS/EIR will include additional information concerning the other alternative sites which were considered.*

Comment 8.6: Letter from the Fresno County, Office of Education dated August 15, 2001. The letter states: "As Fresno County Superintendent of Schools, I strongly support Fresno County maintaining ownership and control of the Fresno County Greenbelt Park on Piedra Road.".

Response: *As previously stated, the local non-Federal sponsor (KRCD) is responsible for providing lands, easements, rights-of-way, relocations, and disposal areas. The Corps will not purchase the property. KRCD has discussed use of a long-term conservation easement with the Corps and County staff, and prefers to use this approach. The Corps staff in Washington DC required KRCD to first consider the "Purchase of the Property" and mandated such wording in the draft EIS/EIR. The Corps and KRCD will request the Corps Headquarters in Washington DC to grant a waiver in order to pursue a conservation easement.*

Text addressing the conservation easement that was included in previous drafts of the project documents will be put back into the final EIS/EIR, Feasibility Report, and Real Estate Plan.

Comment 8.7: "This project will have only minimal benefit unless we get higher water flows in the Kings River. For instance by the Park the flows are lethal to trout at the level described in the Framework Agreement with or with out the Multi Level Intake project. I suggest to only consider the Multi level intake project when flows are increased to a level that sustains a cold water fishery throughout the Kings River Basin for many miles including the Park and past the 180 Bridge."

Response: *The Kings River Fisheries Management Program will maintain minimum flow and suitable water temperatures to sustain coldwater fisheries. The multilevel intake structure would be used to optimize this condition. Even during years where cold water for a minimum flow is not possible because of high water temperatures in the reservoir, the multilevel intake structure could be used to release the warmer water off the top layer to conserve colder layers below in the reservoir. Detailed operations of the multilevel intake structure will be developed for the Operations and Maintenance Manual after the project is constructed.*

COMMENT LETTERS

SEP 04 2001

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

August 28, 2001

Dave Tedrick
U.S. Army Corps of Engineers
U.S. Army Engineer District, Sacramento
1325 J Street
Sacramento, CA 95814-2922

Dear Mr. Tedrick:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS) for the **Pine Flat Dam Fish and Wildlife Habitat Restoration Investigation, California**. Our review and comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementation Regulations at 40 CFR 1500-1508, and Section 309 of the Clean Air Act.

The DEIS evaluates alternatives to restore and protect the ecosystem for fish and wildlife resources in Pine Flat Lake and in and along the Lower Kings River by improving the fishery and woodland habitats, and reestablishing the historic flood plain and native historic plant and wildlife communities. The DEIS assesses the Multilevel Intake Structure Alternative, Byrd Slough Habitat Restoration Alternative, Combined Restoration Plan Alternative, and No Action. The proposed alternative is the Combined Restoration Plan Alternative.

EPA supports the proposed project, which will improve fishery and wildlife habitat and reestablish the historic floodplain and native plant communities. In comparison with grazed lands, riparian forests can more effectively remove sediment and nutrients from surface water and nitrates from groundwater. We, therefore, anticipate that converting grazing lands back to native plant communities will improve water quality in Byrd Slough and the Kings River as well. We, therefore, have rated this DEIS as **LO -- "Lack of Objections"** (see enclosed "Summary of Rating Definitions and Follow-Up Action"). We do, however, have a few comments regarding the DEIS. We recommend that the Corps address these comments in the Final Environmental Impact Statement (FEIS) for clarification purposes.

The DEIS (pp. 2-15, 4-14) indicates that a water quality monitoring program would be implemented during construction of the project. The FEIS should describe the monitoring program; specifically, the FEIS should identify the parameters to be monitored, sampling frequencies, action levels, oversight responsibilities, and measures to be taken if action levels are exceeded.

The DEIS mentions a 2.07- acre staging area near the dam and a one-acre staging area near Byrd Slough, which would be used during the proposed construction activities. The FEIS should describe the staging area sites that would be used both at the dam and near Byrd Slough, and discuss the best management practices that would be used there to prevent impacts to water quality.

The DEIS (p. 4-11) states that site visits would be conducted by a qualified biologist before, during, and after construction to ensure compliance with avoidance measures for special status species. These measures would consist of pre-project surveys for special status species and potential critical habitat at the Byrd Slough restoration site, conducting worker awareness training, and having a qualified monitoring biologist on site during restoration activities. However, specific avoidance measures for special status wildlife species such as bald eagle or Swainson's hawk are not described. The FEIS should discuss whether avoidance measures would be needed during breeding or nesting season or whether the Byrd Slough staging area would be required to be a minimum distance from active nests. The FEIS should describe any such measures.

The proposed project includes installation of irrigation systems in the Byrd Slough restoration areas. The FEIS should indicate whether irrigation is expected to be needed beyond the first three to five years of vegetation establishment. If so, who would maintain it? Would it be used in dry years? If not, would it be decommissioned?

We appreciate the opportunity to review this DEIS. If you have any questions, please call me at (415) 744-1584 or Jeanne Geselbracht at (415) 744-1576. Please send a copy of the FEIS to this office (mailcode CMD-2) at the same time it is filed with our Washington, D.C. office.

Sincerely,

Lisa B. Hanf

Lisa Hanf, Manager
Federal Activities Office

Enclosures

001915

cc: Kings River Conservation District

SUMMARY OF EPA RATING DEFINITIONS

This rating system was developed as a means to summarize EPA's level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the EIS.

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

ADEQUACY OF THE IMPACT STATEMENT

Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1111 Jackson St., Suite 520
Oakland, CA 94607

August 31, 2001

ER: 01/713

Department of the Army
US Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Environmental Resources Branch
Attn: Dave Tedrick

Subject: Review of Draft Feasibility Report and Environmental Impact Statement/ Environmental Impact Report for the Pine Flat Dam, Fish and Wildlife Restoration Investigation, Fresno County, California.

Dear Mr. Tedrick,

The US Department of the Interior has received and reviewed the subject document and has no comments to offer.

Thank you for the opportunity to review this project.

Sincerely,

Patricia Sanderson Port,
Regional Environmental Officer

cc: Director, OEPC, DC
FWS, CNO

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

PAUL D. THAYER, *Executive Officer*
(916) 574-1800 FAX (916) 574-1810
California Relay Service From TDD Phone **1-800-735-2922**
from Voice Phone **1-800-735-2929**

Contact Phone: **(916) 574-1892**
Contact FAX: **(916) 574-1925**

October 10, 2001

File Ref: PRC 5727/PRC 5893

Mr. Dave Tedrick
Environmental Resources Branch
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

Dear Mr. Tedrick:

SUBJECT: Draft Feasibility Report and Environmental Impact Statement/Environmental Impact Report (DFR/EIS-EIR) for the Pine Flat Dam, Fish and Wildlife Habitat Restoration Investigation, SCH 96042044

Staff of the California State Lands Commission (CSLC) has reviewed the subject document. Under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), the Corps, the Kings River Conservation District and the Kings River Water Association are co-sponsors and the CSLC is a Responsible and/or Trustee Agency for any and all projects that could directly or indirectly affect sovereign lands, their accompanying Public Trust resources or uses, and the public easement in navigable waters.

The document addresses a proposed fish and wildlife habitat restoration investigation for the Pine Flat Dam, involving the Kings River and Byrd Slough. Alternatives include, but are not limited to, the construction of a multi-level intake structure on the upstream face of Pine Flat Dam, ecosystem restoration of 13 miles of the lower Kings River, and restoration of approximately 143 acres of riparian and shaded riverine aquatic habitat at Bird Slough.

Under the Equal Footing Doctrine of the United States Constitution (Martin v Waddell, 41 U.S. 367 (1842); Mumford v Wardell, 73 U.S. 423, 436 (1867)), the State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States in 1850. The State holds these lands for the benefit of all the people of the State for statewide Public Trust purposes, which include waterborne commerce, navigation, fisheries, water-related recreation, habitat preservation, and open space. The landward boundaries of the

State's sovereign interests are often based upon the ordinary high water marks of these waterways as they last naturally existed. Thus, such boundaries may not be readily apparent from present day site inspections. The State's sovereign interests are under the jurisdiction of the CSLC.

California holds a fee ownership in the bed of the Kings River between the two ordinary low water marks. The entire river between the ordinary high water marks is subject to a Public Trust Easement. Both easement and fee owned lands are under the jurisdiction of the CSLC (Public Resources Code sections 6301 and 6216).

Our files do not reflect that the CSLC authorized the construction of Pine Flat Dam. As we understand it, the dam was constructed in the late 1940s pursuant to the 1944 Flood Control Act. To the extent that Congress was exercising its authority under the Commerce Clause of the U.S. Constitution, we will require no lease or permit for the dam or any structures built and attached to the dam.

Our files do reflect two existing leases for structures located on or over the Kings River at this location. Lease No. PRC 5727 between the CSLC and the Kings River Conservation District covers the Pine Flat Power Plant. A Department of Water Resources transmission line that connects from the Pine Flat Power Plant to PG&E lines is covered under Master Lease No. PRC 5893.

The nature and extent of the State's interest in Byrd Slough has not been determined. To the extent there is water in the slough, it is subject to a public navigational easement. This easement provides that members of the public have the right to navigate and exercise the incidences of navigation in a lawful manner on State waters that are capable of being physically navigated by oar or motor-propelled small craft. Such uses may include, but not be limited to, boating, rafting, sailing, rowing, fishing, fowling, bathing, skiing, and other water-related public uses.

We appreciate the opportunity to comment. If you have any questions concerning the CSLC's jurisdiction, please contact Curtis L. Fossum, Senior Staff Counsel, at (916) 574-1828.

Sincerely,

Stephen L. Jenkins

Stephen L. Jenkins, Assistant Chief
Division of Environmental
Planning and Management

cc: Curtis L. Fossum

bcc: Alan Scott
Betty Silva
Jane E. Smith

STATE OF CALIFORNIA – THE RESOURCES AGENCY

GRAY DAVIS, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

July 24, 2001

RECEIVED
JUL 26 2001
STATE CLEARINGHOUSE

Clear 8-31-01
e

Kings River Conservation District
4886 East Jensen Avenue
Fresno, California 93725
Attention: Jeffrey A. Halstead

Pine Flat Dam Fish and Wildlife Habitat Restoration Investigation
State Clearinghouse (SCH) Number: 1996042044

Staff for The Department of Water Resources has reviewed the environmental document provided through the SCH and provides the following comments:

Portions of the proposed project are located within the Kings River designated floodway (Piedra to Pine Flat Dam) over which The Reclamation Board has jurisdiction and exercises authority. Section 8710 of the California Water Code requires that a Board permit must be obtained. Section 8710 of the California Water Code requires that a Board permit must be obtained prior to start of any work, including excavation and construction activities, within floodways, levees, and 10 feet landward of the landside levee toes. A list of streams regulated by the Board is contained in the California Code of Regulations, Title 23, Section 112.

Section 7 of the Regulations states that additional information, such as geotechnical exploration, soil testing, hydraulic or sediment transport studies, biological surveys, environmental surveys and other analyses may be required at any time prior to Board action on the application.

Section 8 of the Regulations states that applications for permits submitted to the Board must include a completed environmental questionnaire that accompanies the application and a copy of any environmental documents if they are prepared for the project. For any foreseeable significant environmental impacts, mitigation for such impacts shall be proposed. Applications are reviewed for compliance with the California Environmental Quality Act.

For further information, please contact me at the above address or telephone (916) 574-2739.

Jo Turner

Jo Turner, Chair
Environmental Review Committee

cc: Governor's Office of Planning and Research
State Clearinghouse
1400 Tenth Street, Room 121
Sacramento, CA 95814

Deran Koligian
Chairman
Supervisor, District 1
Board of Supervisors

September 20, 2001

Dave Tedrick
U.S. Army Engineer District
1325 "J" Street
Sacramento, CA 95814-2922

Dear Mr. Tedrick:

SUBJECT: PINE FLAT DAM FISH AND WILDLIFE HABITAT RESTORATION DRAFT ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT

The Board of Supervisors of the County of Fresno has completed its review of the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) - Pine Flat, Dam Fish And Wildlife Habitat Restoration and its companion document, the Feasibility Report. The County supports the multilevel intake structure. Further, the County supports the habitat restoration objectives set out in the EIS/EIR however we believe the alternatives for achieving these objectives require further assessment.

The EIS/EIR assesses impacts of potential projects in the County and, most significantly, includes a project on County-owned parkland. The County's review of the EIS/EIR and the accompanying Feasibility Report resulted in the identification of three inaccuracies that are the premise for Byrd Slough restoration project and the environmental assessment work. These need to be corrected. We also request that there be an expanded analysis of impacts and assessment of restoration project alternatives. These issues of concern are described below.

<u>Description of Study Area (Byrd Slough):</u>

The EIS/EIR is based on two assumptions that need to be clarified. First, the habitat restoration project assumes that the 143-acre County-owned Kings River Greenbelt Undeveloped Park will be acquired by the Kings River Conservation District. This matter has not been formally presented to the Board of Supervisors.

Biola - Calwa - Cantua Creek - Dos Palos - Easton - Firebaugh - Five Points - Helm - Herndon - Highway City
Kerman - Mendota - Mercy Hot Springs - Rolinda - San Joaquin - Three Rocks - Tranquillity
Room 300, Hall of Records/2281 Tulare Street/Fresno, California 93721-2198/(559) 488-3541/FAX (559) 488-6830/1-800-742-1011
Internet Address: www.fresno.ca.gov

The second inaccuracy, which is stated in numerous places throughout the two documents is the decline and degradation of riparian and shaded riverine aquatic (SRA) habitat due to continual cattle grazing at the Kings River Greenbelt Undeveloped Park (Byrd Slough) site. These statements are used as the underlying basis for the restoration proposal. Fresno County terminated its grazing lease in August 1995 and grazing has not occurred for the past six years. The EIS/EIR also fails to acknowledge prior oak tree revegetation activities and the installation of wildlife habitat structures by the Kings River Conservation District, which have occurred since the grazing ceased. The park is presently maintained in its natural state with limited public access provided to the Kings River. The condition of perimeter fencing can be reviewed at the time of project implementation to verify the extent of repairs needed.

An additional misleading statement is the reference to potential urban development of the Byrd Slough site. The subject property is designated Open Space, Floodway, and Agriculture in the Kings River Regional Plan and is in public ownership (Fresno County) and therefore references to potential urban development of the site are misleading.

Impact of Loss of Parkland

If the site is acquired, the impact of the loss of 143 acres of County parkland and its recreational opportunities must be assessed. Mitigation measures for these impacts should be identified including assurances for future public access to the site and the river. The EIS/EIR must include details for use of the site before, during and after the three to five year restoration period to enable an adequate assessment of this impact.

Alternatives:

The Council on Environmental Quality (CEQ) NEPA Regulations (40 C.F.R. 1502.14), stipulate that the alternatives section of a draft EIS is required to rigorously explore and objectively evaluate all reasonable alternatives, include alternatives within the lead agency's jurisdiction, and devote substantial treatment to each alternative. Similarly, CEQA Guidelines Section 15126(d)(2) and (3) requires that the EIR must include a range of potential alternatives to the proposed project that could feasibly accomplish most of the basic purposes of the project and include sufficient information about each alternative site to allow meaningful evaluation, analysis, and comparison with the proposed project.

The EIS/EIR does not adequately address alternatives to the habitat restoration project. While the EIS/EIR identifies ten potentially feasible measures to help restore the ecosystem habitat in the Kings River basin, it is clear that it only focuses on the multilevel intake structure and restoration of the Kings River Greenbelt Undeveloped Park (Byrd Slough) site. It does not identify alternative sites for the habitat restoration work as required by CEQA.

As provided for by CEQA, the discussion and analysis of alternatives should be expanded to include alternate restoration sites. The County would expect that such an analysis would, at the least, include the restoration of the 120 acre and 700 acre parcels owned by the U.S. Bureau of Land Management adjacent to the project site; the restoration to the Avocado Side Channel Slough; the restoration of Byrd Slough without acquisition; and the acquisition of other sites in need of restoration. Since the alternative sites have not been assessed there is also no indication whether restoration of those sites would be environmentally superior to the Kings River Greenbelt Undeveloped Park (Byrd Slough) site.

The restoration of the Bureau's 800 acres are not considered other than to indicate that restoration may include riparian forest and shrub, emergent marsh, and threatened and endangered species habitats. The alternative of restoration of the Avocado Side Channel Slough was briefly addressed but it is not clear why it was dismissed. Other potential sites that could meet the objectives of the restoration project have not been identified nor is there any indication that alternative sites were explored although the Feasibility Report contained a recommendation that such alternatives should be investigated.

Flood Control:

When describing the potential environmental effects associated with the multilevel intake structure (Technical and Environmental Studies, page 71), impacts that are identified were limited to increases in noise levels, disturbance to vegetation and wildlife, and air quality emissions. It does not appear that consideration was given to potential flood-related impacts.

The Fresno County Office of Emergency Services of the Department of Community Health (OES) addresses the potential impacts of floodwaters on properties downstream from reservoirs located in Fresno County. There are three issues related to flood water management and potential impacts to downstream properties that need to be addressed:

- How will the reservoir's normal use for flood control during and after the construction phase be affected?

- Will there be any modification to emergency response and notification procedures as a result of the project?

- Will the risk of flood or dam failure to properties downstream or in the inundation pathway be affected?

Conclusions:

Fresno County recognizes the significance of the objectives sought in the proposed project and supports the project objectives of habitat restoration for fish and wildlife through the multilevel intake system and the revegetation of degraded riparian, wetland, and shaded riverine aquatic habitat along the Kings River. Such activities are consistent with the Fresno County General Plan, which seeks to protect riparian and wetland habitats in Fresno County. While the County of Fresno believes the EIS/EIR should recognize that the acquisition of County park site has not been acted upon by the Board of Supervisors, the County reiterates its support for the multilevel intake structure and the habitat restoration objectives.

It is requested that the comments made in this letter be addressed to provide decision-makers a more complete and accurate EIS/EIR. We appreciate the opportunity to comment on these important projects in Fresno County. Should you have questions regarding our comments, please contact Bernard Jimenez at (559) 262-4870 or Leona James at (559) 262-4497.

Sincerely,

Deran Koligian

Deran Koligian, Chairman
Fresno County Board of Supervisors

DK:cg

c: Board of Supervisors
Jeff Taylor, General Manager, Kings River Conservation District
Bart Bohn, County Administrative Officer
Carolina Jimenez-Hogg, Director, Planning & Resource Management
Janet L. Coleman, Acting Director of Administrative Services

KINGS RIVER WATER ASSOCIATION

4888 EAST JENSEN AVENUE
FRESNO, CALIFORNIA 93725
TELEPHONE (559) 266-0767
FAX (559) 266-3918

September 18, 2001

Mr. Dave Tedrick
U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Re: Comments on the Draft Feasibility Report and Environmental Impact Statement/Report On the Pine Flat Dam Fish and Wildlife Habitat Restoration, Fresno, California

Dear Mr. Tedrick:

The Kings River Water Association (KRWA) hereby submits the following comments on the Draft Feasibility Report and Environmental Impact Statement/Report (EIS/EIR) on the "Pine Flat Dam Fish and Wildlife Habitat Restoration, Fresno, California" (Project).

The KRWA is an unincorporated, nonprofit association consisting of the 28 public and private entities that collectively hold exclusive rights to the water and storage on the Kings River at Pine Flat Dam. The KRWA was formed in 1927 to more efficiently and equitably manage the waters of the Kings River and to resolve competing claims to Kings River water that had resulted in decades of dispute and litigation. The members of the KRWA depend upon and put the waters of the Kings River to beneficial use by providing necessary irrigation water to a land area of approximately 1,000,000 of the worlds' most productive acres in Fresno, Kings and Tulare Counties. The KRWA and its members are committed to the rapid efficient implementation of a unique and highly successful consensus-based fisheries management program on the Kings River, and are therefore very interested in the Project and how it might further enhance that program consistent with the KRWA's duties to its members.

Properly designed and implemented, the Project's elements, and particularly a multi-level intake structure, offer significant opportunities to our fisheries management program.

Accordingly, the KRWA and its member units stand ready to work with the Corps of Engineers to make the multi-level intake structure an efficient and cost effective project. However, as the EIS/EIR makes clear, a great many issues (including the design, operating criteria, goals, cost and funding of the structure) must be addressed and resolved during final design of the project in order for it to be a success. The KRWA therefore wishes to ensure that each step in the development of this very important facility is properly taken.

In that spirit, we offer the following comments on the EIS/EIR so that it can be the most useful and defensible document possible.

1. The Draft Feasibility Report describes the Kings River Fisheries Management Program under the Framework Agreement (the Program). That Program superceded, in its entirety, the 1964 agreement between the Department of Fish and Game and the KRWA. As such it already provides substantial benefits over historic conditions, which should be noted in the EIS/EIR.

2. The selection of 1988, 1992 and 1994 as baseline years raises questions as to whether those years truly represent historic conditions. The water year runoff of those years expressed, as a percent of the long-term average, are 48.2%, 41.1% and 50.2% respectively. A water year with a runoff of 50.2% (even with carryover storage) cannot be considered to be a normal year on Kings River. Although very dry, 1988 is not as severe as years such as 1924 with a 22.8% runoff and 1977 with a 23.1% runoff. We strongly suggest that during final design of the project, that additional years representing a broader range of hydrological conditions be analyzed so that the full benefits of a multi-level intake structure can be understood. Further, it is not clear whether the stated benefits of a multi-level intake structure are based on a comparison to the average of the baseline years of 1988, 1992 and 1994, or are based on a weighting of the long-term distribution of runoff. That point should be clarified.

3. In most years, existing facilities permit instream water temperatures to be maintained at or below 21° C, the temperature apparently assumed in the EIS/EIR to be the upper limit of optimum conditions for trout.[1] For example, during this current year 2001, with a runoff of approximately 50%, outflow temperatures will not likely exceed 19° C and the temperature at Fresno Weir will only reach 23° C for a few hours on some days. Of course, the availability of the turbine bypass in 2002 or 2003 will provide even better control of outflow water temperatures. Even so, in certain critically dry years it may not be possible to maintain instream temperatures at acceptable levels with existing facilities. It is expected that a multi-level intake structure would be extremely useful in managing water temperatures in those critically dry years.

[1]We wonder whether other assumptions about desired temperatures should also be modeled to permit a fuller understanding of the benefits of a multi-level intake structure.

4. In that regard, we suggest that additional operational studies be conducted to evaluate potential benefits of a multi-level intake structure device operated in concert with the fishery management program under the Framework Agreement, particularly in those extremely dry years such as 1924 and 1977.

Yours very truly,

T. F. O'Hal

Tim O'Halloran
Watermaster

TOH:pl

FLY FISHERS
FOR CONSERVATION, INC.
POST OFFICE BOX 25361
FRESNO, CALIFORNIA 93729

September 19, 2001

U.S. Army Engineer Department
Attn: Dave Tedrick
1325 J Street
Sacramento, California 95814-2922

Dear Mr. Tedrick:

Fly Fishers For Conservation, the oldest fly fishing club west of the Mississippi River, was formed for the very purpose of maintaining the Kings River as a viable fishery. We feel that this has been a very worthwhile endeavor that will provide many hours of recreation within easy reach of a fairly large population center.

Therefore we would like to comment on the DEIS/EIR (SCH#96042044) Pine Flat Dam Fish and Wildlife Habitat Restoration, Fresno, California.

We the Board of Directors and Officers of Fly Fishers For Conservation, Inc., after long and thoughtful discussion, do voice for:

Alternative 1 : (Take no Action)	**No support**
Alternative 2 : (Multilevel intake structure)	**Unanimous support**
all other Alternatives:	**No comment**

Sincerely,

Roger A. Miller
President

Dave Tedrick,
U.S. Army Engineer District

RE Pine Flat EIS EIR
9/15/01

I am a commissioner appointed to the Fresno County Recreation and Wildlife Commission since 1993. The commission acts in an advisory capacity to the Fresno County Board of Supervisors on Parks and similar issues. These are my personal comments.

I have reviewed the EIS. I have found many incorrect statements and omissions of facts. I believe the local Sponsor KRCD is either not competent in their ability to prepare a proper project proposal, or they have deliberately mislead the public, the CORPS and the Federal decision makers in order to get approval of this project. There are several infractions of the NEPA CEQA process.

In the past several months they have included in the minutes of their board meetings that they are making revisions to the document and in discussions with Jeff Halstead and Jeff Taylor, I know they know the truth about the park.

I will describe some of the most serious flaws in the proposal and describe why it is inappropriate and show why it should not be approved as presented

Ted Ruffner
938 N. DeWitt Ave
Clovis CA 93611
559-299-5606

Ted Ruffner

1/1

Grazing issue;

Fifty Percent of the AAHU's you propose to achieve by erecting fences to eliminate cattle grazing cannot be achieved. (A1) The document makes over 50 references to cattle being currently grazed on the park or that with out the project, grazing will continue. You claim the park is severely degraded, there is no Oak regeneration and that the vegetation understory is sparse, because of cattle grazing. All of the statements are false.

The county terminated grazing in the park Aug. 1995. An employee that was subsequently dismissed put a few head of cattle on the park Jan. 1997 without permission from the county. I wrote a report about this and sent a copy to Jeff Halstead. I discussed this with him several times since then. The park's administrator knows of no instance of trespass cattle since then. Many employees of the KRCD must pass the park every day, they would see there is no grazing occuring. In 1996 Mr. Halstead wrote a letter to the commission about a parking lot project and he states, "Since extensive fencing will no longer be necessary for the livestock issue," (letter enclosed) (Lease enclosed)

Land that is not grazed, Piedra Road, the Kings River and Bureau of Reclamation land surround the park on three sides. On these three sides of the park, in order for your descriptions to be valid, cattle would have to break out of other fences and then break, the very well maintained Park fences, to get into the park. This was not in your document. On the West Side a neighbor has less than ten cows and the County's fence is reinforced by an electric fence. There is no sign of the park being grazed in at least four years.

There is very good Oak regeneration, dense understory, and a very healthy ecosystem thrives with birds, beaver, deer, and Elderberry Beatles. See pictures of trees and vegetation.

File: 325.12.01.07

September 30, 1996

Mr. Charles Janiel
County of Fresno, Parks Division
2220 Tulare Street, 17th Floor
Fresno, CA 93721

RE: Public Fishing Access at the Greenbelt Parkway

Dear Charles:

Enclosed is some background information (draft initial study) for the public fishing access project at the Greenbelt Parkway. This should assist your staff in determining the level of CEQA compliance. In reviewing the CEQA Statutes and Guidelines (June 1986), our activities would be considered a "project." However, since there is no possibility of a significant impact, the project would be Statutorical Exempt (Ministerial Projects) and also Categorical Exempt (Class 4: Minor Alterations to Land). Both of these exemptions require only a Notice of Exemption by the County (draft enclosed).

We are anxious to have the project move forward. The access to the Kings River would provide needed recreational opportunities for the fishing public. As discussed in the original proposal, the District would provide the environmental assessment (enclosed), materials and labor for the parking area and bulletin board, and monitor fisherman use and fishing success. The California Department of Fish and Game will post and maintain fishing information signs and the bulletin board. The County needs only to approve and permit the project and to provide two property signs and two road signs for the project.

Sincerely,

Jeffrey A. Halstead
Chief, Environmental Division

P.S. Since extensive fencing will no longer be necessary for the livestock issue, there is no need to further pursue the Wildlife Conservation Board grant through the California Department of Fish and Game.

JAH/jaj
L96-0279.t2

Enclosure: As Stated

cc: Rus Wickwire (California Department of Fish and Game, 1234 E. Shaw Avenue, Fresno, CA 93710)

FL-004
Kings River Green Belt Park

LEASE AGREEMENT

THIS LEASE, made and entered into this ________ day of ________________, 1993, by and between the COUNTY OF FRESNO, a political subdivision of the State of California, hereinafter referred to as "LESSOR," with offices at 2220 Tulare Street, 8th Floor, Fresno, California, and PHILLIP BONNETTE, P. O. Box 25, Dunlap, CA 93621, hereinafter referred to as "LESSEE."

W I T N E S S E T H:

WHEREAS, the property of the LESSOR hereinafter described is not now, and may not during the period of this lease, be needed for County purposes.

NOW, THEREFORE, in consideration of the rents, covenants and agreements hereinafter contained and upon the terms and conditions set forth, the LESSOR hereby leases to LESSEE, and the LESSEE hereby takes and hires from the LESSOR, those certain premises hereinafter described; the terms and conditions are as follows:

1. Description

See Exhibit "A" attached hereto and incorporated herein by reference.

2. Term and Termination

The term of this lease shall be for a period of two (2) years, commencing on September 1, 1993, and terminating on August 31, 1995. However, this lease or any part thereof may be terminated by the LESSOR at any time by the LESSOR giving the LESSEE ninety (90) days prior written notice. In the event the lease is terminated by the LESSOR prior to the expiration of the

Tree Planting project, invalid;

The KRCD failed to mention that they already planted in 1996, hundreds of Oak saplings on the very site you now propose. 99% of the trees died. They claimed it was an experiment. Wouldn't you expect to see the results of them planting the exact project trees on the exact area and what the results were in any credible environmental report? See pictures of dead trees (a few live) from their failed project. This makes the rest of the AAHU's you hope to achieve questionable.

This land is 10 miles away from the dam site where the oak trees were inundated. The topography of this park is more floodplain than Foothills, where the dam and lake is located. So this site may not be suitable.

The open areas on this park are naturally occurring historically and should not be converted to all Oak Forest 250 trees per acre.

Although birds and other animals use Oaks, many birds also require open areas to forage for seeds or insects. Raptors need open areas to hunt for mice and voles. Open areas have an important purpose in flood control and a properly functioning riparian system.

Any project needed by the County on the park should carefully studied to create a natural setting and not an artificial Oak Forest.

Meetings,

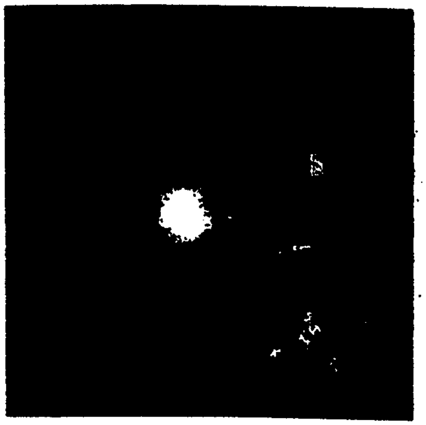
CEQA and NEPA require you have meetings with involved parties. There were no meetings with any decision makers from the county. My commission or the Supervisors were not informed or consulted of the important points of proposal before we received the EIR.
There was never a discussion about a sale of the Park with anyone from the county. See County's response.
The last public meetings were held in 1994 at that time the project site was described as near Avocado Lake.(See KRCD Newsletter.) So the public was not informed either.

4/6

Farms In KRCD Yield A Wealth Of Wildlife, Too

Many of the orchards and vineyards that you drive by are used by a host of different birds and wildlife, according to a survey by KRCD biologists.

As part of the Kings River Conservation District's "Total Resource Management" project sponsored by the U.S. Bureau of Reclamation and the California Association of Resource Conservation Districts, KRCD biologists surveyed wildlife on four project farms during 1995. The four types of farms selected for the resource management study include citrus, tree fruit, almonds and table grapes.



The lark sparrow is one of many different birds that live on farms in the Kings River service area.

KRCD biologists are conducting a 3-year wildlife survey of the four farms while normal farming activities are occurring. The results so far show a variety of wildlife living on the farms.

A total of 36 different species of birds were identified including ring-necked pheasant, California quail, barn and great-horned owls, American kestrel, red-tailed hawk, and over two dozen more common birds. Seven mammal species were found, including racoon, possum, gray fox, squirrel and rabbit. Commonly found amphibian was the western toad and the occasional occurrence of gopher snakes.

Farms can be a haven for valley wildlife as cities encroach on its habitat. Many farmers in KRCD encourage wildlife on their farms. Some even go so far as creating habitat. Owl boxes are beginning to be common in many vineyards and orchards. Barn owls use these owl boxes to nest and as perches for hunting gophers, its preferred prey. Growing a cover crop between trees and vines also provides habitat and food for many species of birds and wildlife.

Farming and wildlife can and do co-exist.▸

Fish and Wildlife Feasibility Study *(continued)*

To be examined are possible development of a multi-level intake structure on the upstream face of Pine Flat Dam in order to control the temperature of water being released to the river through penstocks supplying KRCD's Pine Flat Power Plant.

Other aspects of the feasibility study will focus on possible construction of a pipeline which would convey Fresno Irrigation District water to Mendota Pool on the valley's west side to help increase off-season minimum releases into the river from Pine Flat Dam through a program of water exchanges.

Habitat restoration along the Kings River in the vicinity of Avocado Lake (which served as the borrow pit for rock and gravel during Pine Flat Dam's construction) is also to be explored.

Meanwhile, a related environmental enhancement project continues to move ahead.

KRCD has received a proposal from the Corps of Engineers to conduct computerized temperature modeling studies as necessary parts of the process to develop a turbine bypass. That project, being handled by the Corps on a "fast track" basis as a project modification, will result in construction of a pipeline to connect the three power plant penstocks at the base of Pine Flat Dam. When completed, temperature control of water being released to the river will be improved as a benefit to the river's fishery.

The bypass will permit water to be released through the penstocks at times when the power plant cannot be operated because of low reservoir storage or a lack of irrigation demand. Those situations most frequently occur during late summer and fall months. Currently, when the power plant is not operating releases must be made by the Corps, either from the dam's low- or mid-level sluice gates (depending on the reservoir's surface elevation). Releases of the low-level sluice gates consumes the reservoir's coldest water. Officials hope to have the turbine bypass completed by late 1998.

Still another potential environmental enhancement project may move into a feasibility study at a later date. That study would focus on the possibility of raising Pine Flat Dam to create 93,000 acre feet of additional storage capacity for environmental purposes as well as conducting restoration activities in the Flume Cove region of the reservoir.

KRCD and KRWA have cooperated fully in the Corps study process, which two years ago moved through the reconnaissance stage. Congress authorized the studies to "address measures for improvement of the fishery both in Pine Flat Reservoir and in the Kings River. . . ." Environmental restoration was added to the Corps' other assignments, flood control and navigation, by Congress in 1986.▸

Alternative Sites and use;

Although there were several proposals listed, there were no other sites studied or mentioned for this project. And there were no explanation on why this site was chosen.
This site is misrepresented as not being a park, but one had to look at the map to see that Byrd Slough was in fact The Fresno County Greenbelt Park.
The EIS says there is little use and recreation, false. This is the only fishing access to the river for miles between Avocado Lake Park and Highway 180. Several groups use the park for bird and plant studies. The local schools frequently use the park for field trips. This is a significant impact. See letters from the Fresno County Superintendent of Schools and Cal Trout. The Local Fly Club has adopted the park as a conservation project and plans a parking lot already approved by the Board of Supervisors. See Project.
The County acquired this property with California State Park Bond Funds. The County may not be able to keep any money we would receive if we sold the park.

There are numerous Federally owned and other lands along the Kings River closer to the dam that would be much more appropriate for this project. Study alternative sites.

5/6

RECEIVED

JAN 1 - 2001

FRESNO COUNTY PARKS

FRESNO COUNTY RECREATIONAND WILDLIFE COMMISSION

APPLICATION FOR FISH AND GAME FINES MONIES

FUNDING FOR FISCAL YEAR

2001-02

****

AGENCY: **FLY FISHERS FOR CONSERVATION (FFFC)**

CONTACT PERSON (S): **ROGER MILLER**

MAILING ADDRESS: **1107 E. FEDORA, FRESNO, CA 93704**

BUSINESS TELEPHONE: ( ) **N/A**

RESIDENCE TELEPHONE: **(559) 226-4351**

PROJECT DISCRIPTION: **Small parking facility at the Green Belt Parkway (6 cars) approximately 54 feet be 42 feet, fenced and gravel based with a walk through passage to the park.**

PROJECT JUSTIFICATION: **To provide off road parking at the Green Belt Park (at this time there is only room to park one car beside the road the road). This will permit small groups to utilize the park, or provide parking for school bus outings to the park, to view wildlife in the park and by the river.**

FUNDING REQUESTED: **$1250 for materials. All labor will be volunteer or donated. This is a joint effort between the FFFC, Kings River Conservation District and the Department (KRCD) Department of Fish and Game (DFG)**
See *attachment:*

PROJECT DURATION (MONTHS): **Should take less than a month from time of approval.**

1 attchment

FORMS\F&GApp

Greenbelt Park

Material list for parking facility

All prices are approximate and include tax and delivery.

T-posts 225 @ $3.00 ea.	$ 730.00
Barbed wire 1 roll @ $40.00 ea.	40.00
Peeler core post 6@$10.00	65.00
Gravel 25 tons delivered	<u>390.00</u>
	<u>$1250.00</u>

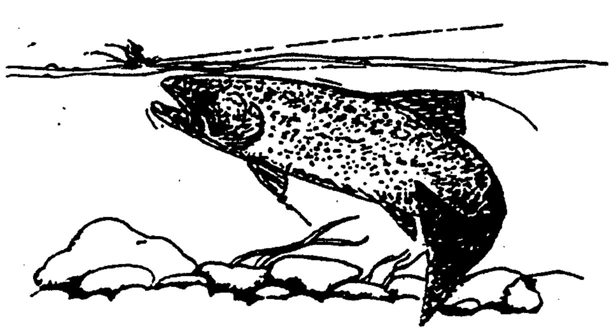
Conservation Project

Last month, I asked each Board Member to please present an idea to the Board on ways in which we could make good use of our Conservation Fund. I am happy to announce that at our last Board meeting our Conservation Director, Ted Ruffner, presented an idea of helping with the improvement of what is now called The Green Belt Parkway, and the Board unanimously approved it. It is designated as an undeveloped public park owned by Fresno County. There are several small-undeveloped parcels like this owned by the county, but this one has access to the river and is a jewel. It has over two hundred acres of land, is lined with huge oaks, cottonwood and sycamore trees, and lies along the Kings River below Winton Park. The County has been looking for someone to improve habitat for fish and animals, and there are thousands of dollars available to be put towards projects like this. The Audubon Society has a bird identification report already completed. I believe this is a great opportunity for our club to place another big mark on the improvement of the Kings River. This would be a perfect place for kids, fishing clinics and club outings. We would like to ensure that it remains a park, in a natural pristine condition, for future generations to enjoy. Within the next two months, I would like to organize a date and time for our entire club to see this beautiful property. We are looking for a wide range of club participation to show our commitment to conservation, and hopefully draw new members who share the same goals. This area is loaded with wildlife, a stream, a canal, the Kings River, and the possibilities are endless. The Board is very excited about this idea, and I hope the club, as a whole will be happy to take on this great project.

Thank you,

Andy Wade

President



IT DOESN'T HAVE TO BE

It doesn't have to be a beautiful wild Rainbow trout, or any other trout for that matter on the end of your fly line, for you to feel the excitement and adrenalin that fly fishing has to offer. Nor dies it have to be a dry fly, being sipped off the surface, to get the complete rush that a decent size fish gives you when it connects you to it's world, with the bending of your rod.

The first thing I ask my students when I teach my fly fishing and tying classes at Clovis Adult School, here in the San Joaquin valley, is how many of you are just going to fish for trout? From a class of people that ranges from ten to fourteen, men, women and children, (I'm seeing a lot more married couples, or women just by themselves these days-witch I think is fantastic!) a few hands will rise.

A couple of them will smile smugly and say I'm just going to fish for trout, well on their way to trout snobbery and limited fishing opportunities. Ha- not in my class! It doesn't have to be. Others are surprised to find out the many different fish that will take a fly.

Example" A large mouth bass attacks a fly violently! When a big mouth takes a fly, top water or below, it's heart stopping, particularly if the fly is three feet from the pontoon you're sitting in. Bad words can come out of your mouth.

Then there's smallmouth. Smallmouth are the favorite freshwater fish of two of the most famous fly fisherman in the worked, Lefty Kreh and Bob Clouser. Mr. Clouser invented the clouser minnow for smallmouth. What more can I say?

Stripers-if I caught Mr. Linesides more regularly I might not fish for anything else. The strength of just a ten pounder pulling line and backing off the reel, and disappearing in the distance can be very jumbling indeed. It happened to me at Millerton Lake.

Crappie- here is one under rated fish. They are quiet hitters you can be in a fight with one before you know it's on your line.

Last but not least-Bluegill, Redear (my personal favorite) or any other member of the sunfish family. A bluegill between eight and twelve inches, will take an insect nymph or adult, with the same caution that a Rainbow or Brown trout will, and they will give you just as much of a challenge. So when you go looking for excitement and that adrenalin rush created when a fish takes your fly, you don't have to cast your line over just trout.

It simply doesn't have to be...Wrap Em Tight!

Rickey (Noel) Mitchell

KEEPER OF THE STREAMS

August 27, 2001

Fresno County Board of Supervisors
2281 Tulare St. Room 301 Hall of Records
Fresno, CA 93721

Dear Supervisors:

The U.S. Army Corps of Engineers has recently released a Draft Environmental Impact Statement for the Pine Flat Dam Fish and Wildlife Habitat Restoration Project on the Kings River. We believe that one phase of this analysis is valid of support from the Board but the proposal to acquire the 140 acre Kings River Greenbelt Park from the County is not. Having worked for years on issues regarding the fishery on the Kings we believe that a multi-level intake structure at Pine Flat Dam is a workable solution. This proposal was one that has been looked at over the years by many different experts and seems to hold merit. We do have concerns that even placing a multi-level intake structure into the dam may not solve the problems for trout if minimum instream flows are not maintained.

The acquisition of the property by the Corps of Engineers is one in which we feel holds no merit, in fact it will hinder access that is already limited on the Kings River. Since many of our members use the Kings River for fishing this park is one of the only public access points at this time. If the County sells the property to the Corp access could be denied for many years due to their plans to replant the area, and build fences. What seems ironic is that this is one section of the river that seems to already be at a natural state and not in need of further plant cover. We also find it interesting that they plan on building cattle fence where fence already exists. In fact, we believe that cattle have not used this area since 1995. Many schools, recreationalists and fishermen use this park because of its pristine nature.

As we understand the National Environmental Policy Act, you can agree to one part of their alternative without agreeing to the other. We believe that our 6,000 members would like to see this happen. Do not sell this unique park to the Corp of Engineers, it will not help the fishery and will only hinder an already critical problem with access to the Kings River.

Do not get us wrong. We are in favor of habitat improvement along this river, we just feel this is the wrong location for that kind of plan.

Thank you for your consideration in this matter.

Sincerely,

R. Brett Matzke

R. Brett Matzke
Public Lands Director

36563 Mudge Ranch Road • Coarsegold, CA 93614 • (559) 65-TROUT
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Peter G. Mehas
Superintendent

Fresno County Office of Education

August 15, 2001

Deran Koligian
Fresno County Board of Supervisors
2281 Tulare Street, Room 301-Hall of Records
Fresno CA 93721

Dear Mr. ~~Koligian~~ Deran:

As Fresno County Superintendent of Schools, I strongly support Fresno County maintaining ownership and control of the Fresno County Greenbelt Park on Piedra Road.

I am personally familiar with this beautiful park. It is one of a handful of natural remnants of what the Kings River area has looked like for hundreds of years. The pristine nature of the park makes it an excellent field trip site for both ornithological and botanical studies.

Many of the school children in Fresno County as well as university students visit the park frequently. Additionally, schools also use the park for planting fish from their "trout in the classroom programs."

It would be a travesty for the County to lose ownership of this excellent outdoor education classroom and for the County School's children to lose access to this precious resource. I respectfully request you do not consider turning over the Greenbelt Park to any other governmental agency.

Sincerely,

Dr. Peter G. Mehas
Superintendent

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Multi Level Intake:

This project will have only minimal benefit unless we get higher water flows in the Kings River. For instance by the Park the flows are lethal to trout at the level described in the Framework Agreement with or with out the Multi Level Intake project. I suggest to only consider the Multi level intake project when flows are increased to a level that sustains a cold water fishery throughout the Kings River Basin for many miles including the Park and past the 180 Bridge.